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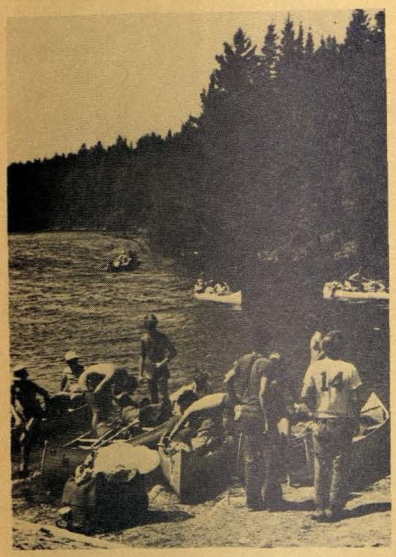
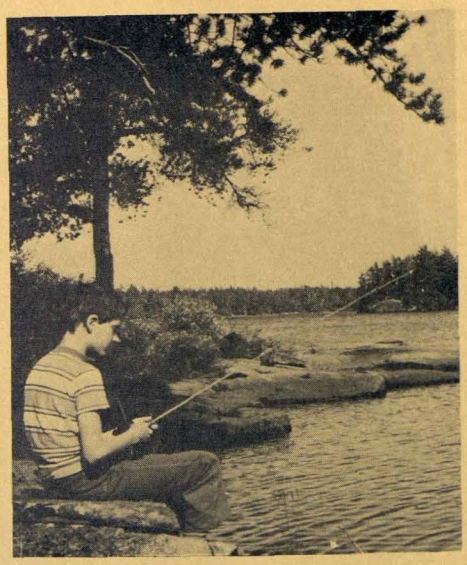
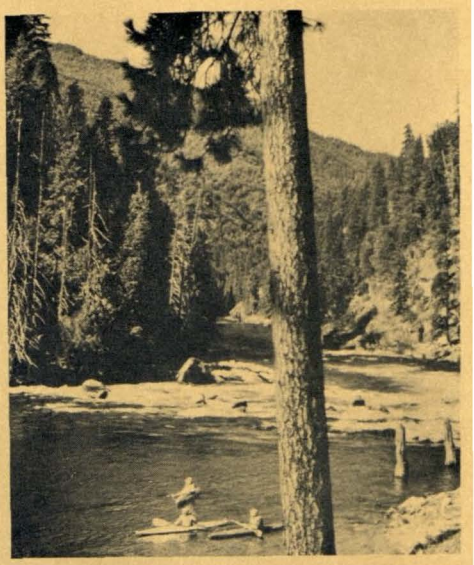
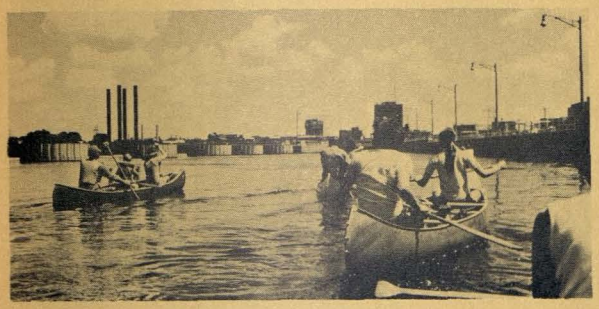
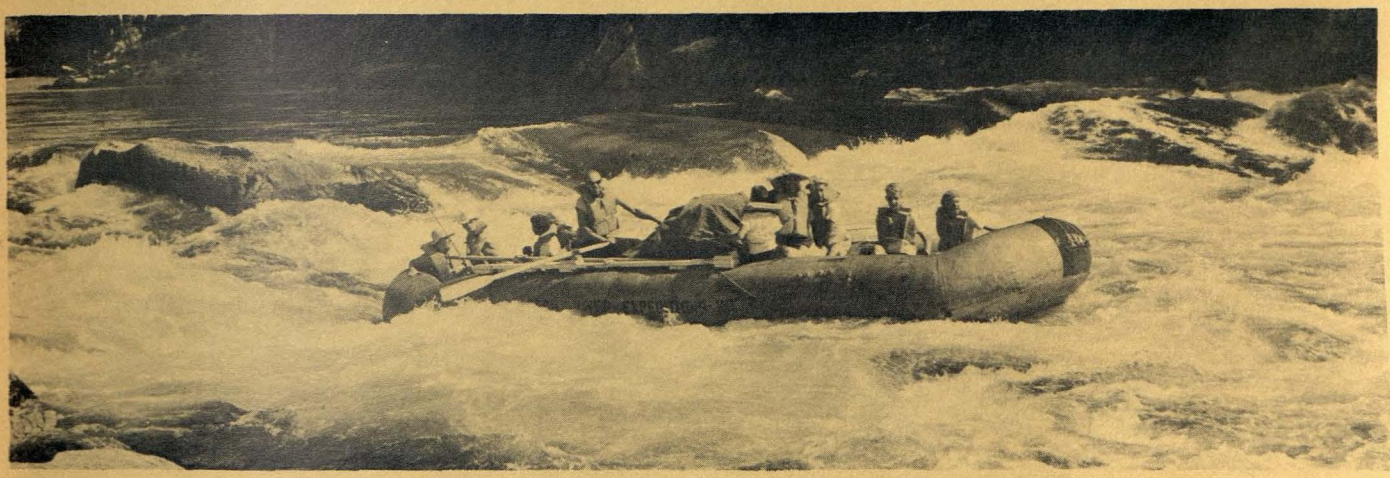








SOME RECENT PRODUCTS OF RIVER RECREATION RESEARCH



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SOME RECENT PRODUCTS OF RIVER RECREATION RESEARCH

Papers presented at the Second Conference on Scientific Research in the National Parks, November, 1979, San Francisco, California.

TECHNICAL COORDINATORS:

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FOREWORD

The National Park Service and the American Institute of Biological Sciences sponsored the Second Conference on Scientific Research in National Parks, November 26-30, 1979 in San Francisco, California. More than 500 scientists and managers attended from local, State, and Federal organizations.

Included in the Conference were 18 sessions and 55 papers dealing with the sociological aspects of recreation behavior. The nine papers appearing here were presented during three of those sessions and focus on research into the sociology of river recreation. These papers do not cover the breadth of research in this area, but they are examples of current issues that concern researchers and resource administrators. The papers also reflect the growing base of knowledge in this emerging field of research.

David W. Lime, Project Leader for the Backcountry River Recreation Management and Research Project of the North Central Forest Experiment Station, was program organizer and chairman for these sessions. Donald R. Field, Associate Regional Director for Science and Technology, Pacific Northwest Region, National Park Service, was general chairman for the Sociology Program at the Conference.

The papers are printed here essentially as submitted by the authors except for some minor copy editing to assure uniformity of style.

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HIGHLIGHTS

The sociology sessions of the National Park Service Second Conference on Scientific Research focused upon research undertaken on local, State, and Federal land—both terrestrial and aquatic environments—that has implications for Park Service management. The nine papers presented here pertain to four interrelated issues: (1) the potential of a nationwide data base that can describe patterns of recreational use as well as the characteristics and preferences of recreationists among river environments; (2) the development of research methods to measure elements of the outdoor experience, such as recreational satisfaction and site attraction or "demand" for river settings; (3) the resolution or better understanding of critical topics facing administrators, such as allocating use to the commercial and private sectors, social carrying capacity and displacement of recreationists within and between river environments, and the suitability of river settings and activities to satisfy the diverse preferences and tastes of the recreating public; and (4) the application and use of social science research to solve practical problems.

The paper by Lime, Knopf, and Peterson discusses the potential value of viewing rivers regionally or nationally as a system and the subsequent need for baseline information on how rivers are used and by whom. They propose a program of long-term cooperative research on river recreationists nationwide to develop and apply standardized survey methods for describing patterns of behavior, characteristics, and management preferences of recreationists.

The papers by Ditton, Graefe, and Fedler and by Peterson, Lime, and Anderson discuss ways to measure the illusive concepts of recreational satisfaction and site attraction or demand. Ditton *et al.* present an attitude scale that samples and quantifies overall satisfaction. Specific components of satisfaction also are identified. Findings suggest that satisfaction is best measured by a scale that includes innovative as well as more customary general statements. Findings also support the notion that overall satisfaction is influenced by satisfaction with particular aspects of the experience.

Peterson *et al.* address the processes by which people choose between and among recreational sites in pursuit of leisure activities. Site attractiveness and site "demand" modeling are useful methods of analysis. The first topic is illustrated by a simple distance-decay model, applied conceptually to lottery rationing and empirically to several rivers. The second topic is illustrated by applying a logit model to several rivers. Finally, theory is presented to clarify conditions in which single-site analysis is valid and to identify the kind of model needed if specific rivers are to be managed as part of a nationwide system of river recreation opportunities.

Papers by Utter, Gleason, and McCool, by Becker, Niemann, and Gates, and by Schreyer and Roggenbuck present the results of recent studies of the concepts of recreational use allocation, displacement, and substitutability. Utter *et al.* explore the highly controversial process of allocating use between commercial and private sectors on whitewater rivers. In a study of actual and potential river floaters on the Middle Fork Salmon River, Idaho, a lottery rationing method was preferred by private users and people not receiving a permit. The advance reservation method was favored by commercial users. No relation was found between the individual's stress release/escape motives and their preferences for allotment and rationing techniques.

Surveys by Becker *et al.* during 1977 and 1978 on the Lower St. Croix and Upper Mississippi Rivers examined the hypothesis that no inverse relation exists between actual user density, crowding, and satisfaction. When each of the study rivers was viewed individually, no relation between density, crowding, and satisfaction was found. However, when viewed as a system, it was discovered that a portion of users from the Lower St. Croix, who were sensitive to its high use levels, were now on the Mississippi. Also, the aggregate user population on the Mississippi was more sensitive to user density than the aggregate Lower St. Croix population. Users were apparently dividing themselves between the two rivers: those users seeking high interaction were using the Lower St. Croix and those seeking low density experiences were using the Mississippi River. Those Upper Mississippi recreationists who formerly used the Lower St. Croix cited crowding as the dominant reason for moving. It is suggested that changes in a resource component may alter the user population on the site and will affect the entire resource system by displacing users who are no longer satisfied with their experience.

Schreyer and Roggenbuck suggest that National Parks are symbols of cultural values. Their study in dinosaur National Monument explores the extent to which visitors to a Park Service area hold tangible images of the meaning and purpose of National Parks and the relation of this image to a person's background, on-site behavior, attitudes concerning the use of such places, and preferences for Park Service management schemes. Two research issues are addressed: (1) the relation between social definitions of recreation places and behavior, and (2) the feasibility of identifying a primary park clientele for decisionmaking.

The papers by Shelby, Jensen, and Chilman consider the use of social science in the management and planning process. Research by Shelby in this area suggests two things. First, complex decisions that use research results are likely to be untidy and "interactive, rather than rational and linear". Second, a number of political factors may affect research utilization. He presents a study of sociological issues and research in Grand Canyon National Park, Arizona that shows a complex decisionmaking process supporting the interactive view. The study also is used to develop a number of "principles" that show how political factors affect utilization.

Jensen notes that social science research is a tool for management when examining policy issues, but such information is not necessarily the basis for establishing or implementing policy. Social science can aid in guiding policy, such as establishing social carrying capacity or providing alternative scenarios about the relation of various use limits to experience factors.

Chilman *et al.* describe a research program designed to gather basic data for determining recreation carrying capacity on Ozark National Scenic Riverways in Missouri from 1972 to 1977. The results of the research were widely distributed to interested publics before hearings in 1979. A management decisionmaking model was developed that incorporated the results of the research.

One of the conclusions from the Conference was that the future of social science research in support of resource management hinges upon the accumulation of national and regional data. Once established, the data base could provide the foundation to determine whether management concerns and issues associated with a specific site require additional

research. If research is required, the data base can be a guide to define the questions or issues to be tested. Such information might likewise provide trend information on changing patterns of recreation use, changes in the composition of user populations, and provide comparisons in recreation use between Forest Service, Park Service, and Bureau of Land Management areas. Changes within a given recreation area can likewise be monitored. Finally, a national and regional data base might well provide the basis upon which management objectives and policies are examined, leading to a more effective resource management policy.

It would be difficult for any one agency or single scientist to generate such a data base. Therefore, a joint research effort, such as that emerging on river recreation between the Forest Service, National Park Service, Bureau of Land Management, and the Tennessee Valley Authority, has merit. The Second Conference on Scientific Research in the National Parks served as a significant forum to foster communication for joint research and the benefits which can derive from its undertaking.

THE NATIONAL RIVER RECREATION STUDY: GROWING NEW DATA BASE WITH EXCITING POTENTIAL

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The National River Recreation Study is a nationwide survey of river recreation use with a time horizon of at least a decade. The primary goal is to describe characteristics and preferences of recreational users for a variety of rivers using standardized measurement instruments. A secondary goal is to describe the Nation's spectrum of river recreation opportunities, and then to identify a set of rivers representative of that spectrum. This set then can be used in future research to monitor change in the character of national river recreation use (Knopf and Lime 1979).

Impetus for such large-scale study arose simultaneously from resource managers and the research community. Managers needed an efficient mechanism for documenting user preferences before they could develop river management plans. Managers also were contending with emerging problems of use conflicts, depreciative behavior, rationing of resources, and environmental impacts. The appeal for basic information was widespread across resource management agencies at federal, state, and regional levels (USDA Forest Service 1977).

At the same time, the research community saw the need to counter a trend toward isolated, noncomparable case studies in river management (Hecock *et al.* 1976). There was a call for standardized methodology and systematic, coordinated inquiry of national scope to allow comparisons both in time and between resources.

THE NEED FOR INFORMATION

Our Nation's waterways have experienced a tremendous increase in recreational use in the last decade. Every indication is that this upward trend will continue (Hecock 1977). Public concern for proper planning and management of waterways has accompanied this increase. Evidence of this concern is the voluminous public input associated with river management plans on specific rivers and with studies of rivers for inclusion in the National Wild and Scenic River System as well as state programs (Eastman and Brown 1979, Priesnitz 1979).

Both environmental and social problems have been created by increased numbers of river recreation users. Experience has shown that the most serious problems generally involve the management of people and their behavior (Carothers *et al.* 1976). More is known about the physical and environmental problems and their solutions than the social ones. Recreation planners and managers often have been forced to make decisions on intuition and "best guess". Identification of specific management problems, the planning of facilities, development of regulations and public information programs, environmental impact statements, prediction of use patterns, and classification studies would all be aided by better data on river recreation use.

Not only have public resource administrators and planners recognized the need for information on river

recreation use and users, the legislative branch of government has mandated the collection and use of such information for decisionmaking. In the Forest Service, for example, the importance of knowing how river (as well as other) environments are used and by whom and monitoring change over time is acknowledged in the 1974 Forest and Rangeland Renewable Resources Planning Act (RPA). This legislation was amended by the National Forest Management Act (NFMA) of 1976 (16 U. S. C. 1600). Regulations published in October 1979 for implementing provisions of the NFMA clearly specify such information is required, not only to plan and implement programs, but to evaluate the effectiveness of these activities as well (Federal Register 1979). The Bureau of Land Management also needs such information on river recreation use to implement the Federal Land Policy and Management Act of 1976 (43 U. S. C. 1701).

Growth in numbers of river recreation studies has paralleled the growth of river recreation use, public interest in preserving resources, attendant management problems, and legislation calling for greater specificity in land use planning and management. The recent review by Anderson *et al.* (1978) lists nearly 100 studies relating to the identification of river use and users. Since that publication, more than 30 documents on this subject have been published.

Unfortunately, most studies of river use and users have been one-time efforts without follow-up inquiry. Most have been one- or two-river case studies of short duration, usually one season. Each study typically has used a different survey instrument, and many studies have been poorly designed in terms of limited sample size, representativeness, and methodology. As a result making comparisons both among rivers and across time has been virtually impossible. And, much of the research has been funded and/or encouraged by land managers who frequently want one-time, one-river, single activity, descriptive studies that reflect local conditions. Seldom has research been funded to systematically study regional, even basin-wide rivers as a system so recreation uses can be better planned and allocated to reflect the mix of experiences desired by the public (Lime 1977).

THE RESEARCH FOCUS

What sets this program of research apart from many others is the application of standardized data collection instruments over a variety of river environments nationwide. This permits a much needed regional and national perspective and allows for the monitoring of change. Accordingly, the study interests both resource administrators and researchers. It serves not only the needs of local resource planners and managers but also will yield insight into the dynamics of supply and demand for river recreation opportunities nationally.

The target population is people who travel on rivers or streams by raft, canoe, kayak, motorboat, innertube or some other conveyance. Stationary river recreationists such as fishermen, swimmers, shore users, and riparian landowners are not the focus of the study. However, the general scope of the research and many of the conceptual issues addressed could be applied to these populations.

To meet the intent of this research the following objectives were established.

1. Develop survey instruments to obtain the following:
   a. Level of satisfaction with the river experience.
   b. Reasons for using the river as a recreational resource.
   c. Number, severity, and kinds of problems experienced by users while recreating.
   d. Reactions to numbers of people encountered.
   e. Perceived conflict between different types of river users.
   f. Perceived degree of environmental impact arising from recreational use of the river.
   g. Degree of support for specific management practices.
   h. Characteristics of the user: age, occupation, education, physical impairment status, amount of prior use of river stretch, and nature of prior experience in recreational use of rivers.
   i. Characteristics of the trip: access points used, mode of travel, length of trip, party size, timing of trip (weekend vs weekday), river stretch used, craft ownership (private vs commercial), type of group (e. g. , family vs organization), and time at which decision to visit the river was made.
   j. Demand for the river resource, in terms of both absolute numbers of users and willingness to pay for the experience.
2. Apply the instruments to representative samples of recreationists on a variety of rivers nationwide.

3. Develop a data processing system capable of offering immediate, cost-efficient summarization, interpretation, and dissemination of the data to resource planners and managers.
4. Make within- and cross-resource analyses to describe, from a national perspective, the character of supply and demand for river recreation, determinants of a quality experience, significant problems in river management, and viable solutions to these problems.
5. Identify a set of river stretches representative of the Nation's spectrum of river recreation opportunities that can be used in future research to monitor change in the character of national river recreation use. Follow-up studies would be made at 3- to 5-year intervals.

To meet study objectives, it is important to consider a broad range of river recreation opportunities. Rivers are selected for study based on the following criteria: (a) The spectrum of river recreation opportunities available nationwide is represented, ranging from whitewater to flatwater, urban to backcountry, and multiple-day to brief excursions, (b) A range of geographic areas within the contiguous United States and Alaska is represented, (c) Different types and levels of recreation use are represented, (d) Different kinds of river management problems and issues are represented, and (e) Management agencies for the study rivers are interested and cooperative.

PROGRESS THUS FAR

The National River Recreation Study has developed over a 5-year period. Several universities cooperated in this development, and there have been formal working relationships with representatives of the Bureau of Land Management, Forest Service, Tennessee Valley Authority, National Park Service, and several natural resource management agencies of individual states. Resource managers have had a significant role in the formation of this study—in calling for its creation, in setting study objectives, in creating content of the instrumentation, in selecting study environments, and in establishing procedures for analysis and information dissemination.

Survey instruments or proto-types developed through cooperative research have been applied nationwide (fig. 1). Since 1977, 39 different rivers or

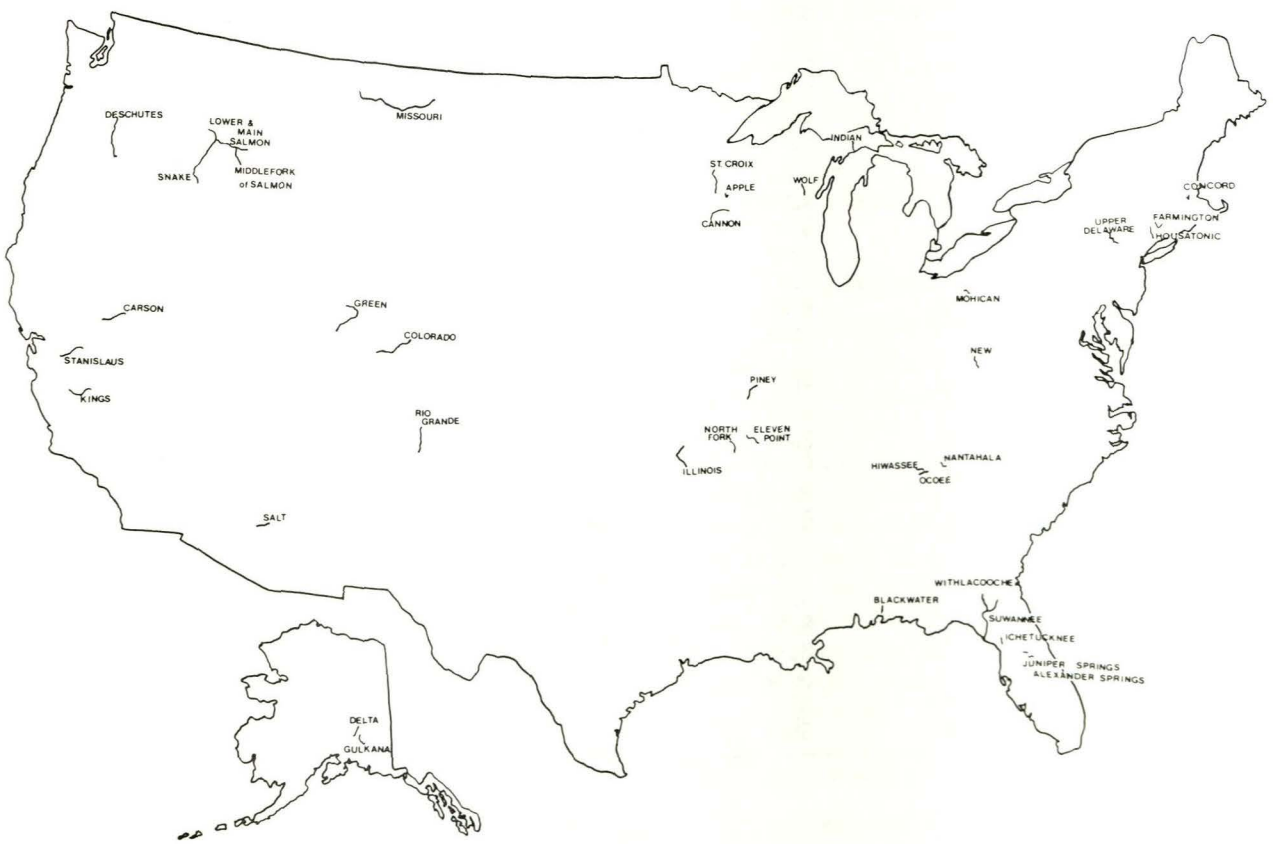

Figure 1. —*The National River Recreation Study- Sites: 1977-1979*

river stretches have been studied: 11 were studied in 1977, 13 in 1978, and 23 in 1979. Five rivers were studied more than one use season (table 1).

Table 1.—*River stretches included in the National River Recreation Study: 1977-1979*

Year	River	State	Management Agency
1977	Apple	WI	State
	Colorado	CO	BLM[1]
	Deschutes	OR	BLM
	Hiwassee	TN	TVA[2]/FS[3]
	Illinois	OK	State
	Middlefork Salmon	ID	FS
	Missouri	MT	BLM
	Mohican	OH	State
	Nantahala	NC	TVA/FS
	Ocoee	TN	TVA
	Salmon, Main	ID	FS
1978	Cannon	MN	State
	Colorado	CO	BLM
	Eleven Point	MO	FS
	Kings	CA	FS
	Missouri	MT	BLM
	North Fork	MO	FS
	Ocoee	TN	TVA
	Piney	MO	FS
	St. Croix	MN/WI	NPS[4]
	Salt	AZ	FS
	Snake	ID/OR	FS
	Stanislaus	CA	BLM
	Wolf	WI	State
1979	Alexander Springs	FL	FS
	Blackwater	FL	State
	Carson	NV	BLM/FS
	Colorado	CO	BLM
	Concord	MA	State
	Delta	AK	BLM
	Deschutes	OR	BLM
	Farmington	CT	State
	Green	UT	FS
	Gulkana	AK	BLM
	Housatonic	CT	State
	Ichetucknee	FL	State
	Indian	MI	FS
	Juniper Springs	FL	FS
	Missouri	MT	BLM
	New	WV	NPS
	Ocoee	TN	TVA
	Rio Grande	NM	BLM
	Salmon, Lower	ID	BLM
	Stanislaus	CA	BLM
	Suwannee	FL	State
	Upper Delaware	NY	NPS
	Withlacoochee	FL	State

[1]Bureau of Land Management.
[2]Tennessee Valley Authority.
[3]Forest Service.
[4]National Park Service.

THE DATA COLLECTION INSTRUMENTS

There are two phases of data collection on each study river. In the first phase, recreationists are interviewed briefly at access points to obtain basic information on the nature of their visit. Each person 16 years of age and older completes a form distributed by an interviewer. About one minute is required per person to complete the on-site interview. The interviewer then talks with one member of the group to characterize the group's trip as a whole.

These on-site interviews provide information about length of stay, number and type of watercraft used, number in group, entry and take-out points, prior experience of users in visiting the river, and the degree to which the visit was a primary purpose of their trip away from home. Names and addresses also are obtained for the second phase of the study in which selected individuals are sent a questionnaire.

A sufficient number of sample days are chosen on each river to (a) ensure representation of the total use character during the season of interest and (b) secure interviews with approximately 1,500 recreationists per river stretch. For rivers receiving low usage, required sample sizes are reduced accordingly.

In 1977, 1978, and 1979 approximately 12,700 groups and 50,500 individuals were interviewed at river accesses on 39 different rivers. On many of the rivers administered by a public agency (especially the Bureau of Land Management), data was collected by agency personnel. For those resources where such assistance was not available, we provided the necessary field technicians and supervision.

In the second phase, questionnaires are administered by mail to a representative sample of recreationists interviewed on-site. For statistical reliability and requirements of scaling (Nunnally 1967), at least 200 usable returns per study area are required. Based on an estimated usable return of at least 60 percent, a sample of 350 people per study area are mailed the questionnaire. Questionnaires are sent within 8 weeks of the on-site contact following the methodology recommended by Dillman (1978). Two follow-up mailings are sent to nonrespondents at 3-week intervals. The second mailing includes an additional copy of the questionnaire. Approximately 20 minutes is required to complete the questionnaire.

The questionnaire has undergone a developmental process over 4 years beginning in 1976. The form now in use draws heavily from an instrument developed

and used in cooperation with Northwestern University. That questionnaire was derived in part from several studies, with particular emphasis on cooperative research on the Colorado and Green Rivers (Schreyer and Nielson 1978).

From the 50,500 individuals interviewed on-site at 39 rivers in 1977, 1978, and 1979, nearly 16,000 have been sent mail questionnaires. A response rate of 56 percent was achieved for the 1977 sample compared to 73 percent in 1978. The differences in response reflect in part an improvement in the efficiency of the questionnaire and in mailing and follow-up procedures.

THE DATA BASE

The last 3 years of data collection have provided a large, broad-based and diverse information set capable of answering a variety of questions of interest to both resource administrators and researchers. Analyses are proceeding along two fronts. First, an outgrowth of Study Objective 3, is the development of basic tabular summaries of visitor characteristics, preferences, and opinions geared to the information needs of the appropriate river planners and managers. Second, and related to Objective 4, is the concern with theoretical, conceptual inquiries related to the issues of recreation "demand," choice and selection processes, and dimensions of satisfaction and a quality recreational experience. From these two activities, it will be possible to pursue a third activity, time series and cross-resource comparative analyses.

Basic Summaries for Planning and Management

Resource administrators have had a pivotal role in helping to identify what information is needed and how it should be presented. Basic descriptive data corresponding to the kinds of issues outlined under Study Objective 1 (a-j) seemed important; and, simple frequency distributions of visitor response to each question and basic statistics such as mean scores and standard deviations are prepared for appropriate questions for each river. Another primary undertaking has been to develop standardized tables and display formats to summarize user response to a number of issues identified as central to more effective decisionmaking. The data system allows fast retrieval of information, and many of the tables are prepared for distribution directly from the computer.

Approximately 50 tables have been developed, and they follow the issues outlined in Study Objective 1. Many of them provide the opportunity for field administrators to compare characteristics of specified subpopulations (such as first-time vs repeat visitors, private vs commercially outfitted groups, rafters vs kayakers vs canoeists, high solitude orientation vs low solitude orientation, day users vs overnight visitors and local residents vs users who travel a considerable distance to visit the river) along any of the parameters from the on-site interview or the questionnaire. In addition to the attendant cost efficiency of the standardized tables, the system structures the data into forms ready for field use and interpretation.

Information can be displayed for one river or compared for several rivers. For example, one question addressed in the mail questionnaire focuses on the number, severity, and kinds of problems visitors experienced during their trip. Using the data processing system, the manager can extract a profile of the perceived problems of the river in comparison with any other river or rivers in the data base. This can reveal strong points as well as weak points which may require management attention. Specific facts can also be retrieved, such as the proportion of individuals reporting that someone in the group received an injury. This would allow a partial assessment of potential safety problems; and, cross tabulation with variables such as composition of the group, size of group, and time of year the visit was made might reveal some contributing factors which, in turn, could help to focus management attention.

Theoretical Issues in Recreation Behavior

Beyond providing basic summaries of user characteristics and opinion, the data set is a rich and growing resource for examining a variety of methodological and theoretical issues in recreation behavior. This is not to say resource administrators will be uninterested in such information. On the contrary, the products of multivariate analyses and a better understanding of processes contributing to recreation behavior and visitor satisfaction add substantially to more complete and effective decisionmaking. The five topics which follow provide only a sampling of the potential.

Predictors of user satisfaction

A basic dependent variable included in the mail questionnaire is perceived quality of the river trip.

Respondents describe how strongly they agree or disagree to a variety of statements about feelings toward a river trip. Responses are subjected to cluster analyses to identify dimensions along which this variable should be defined (e.g., quality of social experience, quality of management, etc.). Then, the focus is on identifying predictors and intervening forces which affect the perceived level of quality along each dimension. Possible predictors include: reasons for making the trip; problems experienced during the trip; amount and kinds of encounters with other river users; prior experience; and, other characteristics of the trip and user.

Segmenting user populations on the basis of desired outcomes

Research has shown that within specific populations of recreationists, substantial diversity among individuals can exist in terms of experiences sought (Driver 1976). The basic tenet is that recreationists seeking different experiences react differently to particular environmental features, find different sources of satisfaction, and assign different priorities to alternate management strategies. Using object typing methodology (Nunnally 1967, Tyron and Bailey 1970), specific river populations are stratified into groups differing in reasons for using a river. Then, differences between groups in user characteristics and management preferences are explored. Such segmentation approaches are common to market research (Frank *et al.* 1972) and provide more realistic accounting of the diversity of demand (Shafer 1969).

Crowding and displacement

Defining the social carrying capacity for river recreation resources is an elusive, but necessary task of management (Lime and Stankey 1971). One ingredient in carrying capacity calculation is visitor response to existing use levels. The literature suggests that crowding perception is related to use density, behaviors encountered (Stankey 1973), expectations (Schreyer *et al.* 1976), motives (Roggenbuck and Schreyer 1977), method of travel (Heberlein 1977), and characteristics of the user. Each of these elements is measured in the mail questionnaire; and, the effects of each of these variable sets are explored simultaneously through multivariate analyses.

Of further concern is the relationship between level of perceived crowding and willingness to return to the river. It has been hypothesized that as resources become more popular, crowd-sensitive users are displaced by those favoring more socially-oriented experiences (Hendee and Campbell 1969, Clark *et al.* 1971). While this process has been described in theory, there are few existing empirical analyses (Nielsen and Endo 1977).

Demand Functions

Using travel-cost methodology (National Academy of Sciences 1975), trip demand functions are derived for study rivers (the focus of another paper in this Proceedings). A data base is formed by response to the "Zip Code" and "Purpose of trip" questions from the on-site interview. Creation of these functions allows: (a) evaluation of the national versus regional versus local significance (b) comparison and classification of rivers according to their ability to attract visitors, (c) explanation of the "attractiveness" of rivers for recreational use in terms of measurable and manageable features of those rivers, and (d) valuation of the recreational use of rivers.

Correlates of the desire for management action

Research has shown river recreationists can differ in their opinions about the appropriate roles of resource managers (Schreyer *et al.* 1976). Several questions in the mail questionnaire provide measure of the degree to which respondents believe the character of use on the river should be regulated. Characteristics of those in favor of management intervention are compared with those opposed to it. Further, the relative role of on-site experiences (as measured by visitors' perception of the kinds and severity of problems experienced while on the trip) in influencing the desire for management action is explored. From such analyses, managers will be able to understand specific sources of pressure for action, both in terms of the clientele which call for it and the conditions which precipitate it.

The Potential for Trend Analysis

Because the study encompasses at least a 6-year sampling frame, beginning with the 1977 use season and extending through the 1982 use season, it will be possible to describe use and users for a wide variety of river conditions and environments, and to prepare a foundation for documenting change. This wide assemblage of information will provide the needed empirical base for selecting a representative core of rivers for future time series analysis. It is anticipated followup studies would be made at 3- to 5-year intervals. Of course, rivers other than the set of core

rivers could be studied to aid in answering specific management questions. And, other types of rivers could be added to the core set as more is learned about what constitutes variability.

The specific dimensions along which to define a representative set of rivers will be empirically determined. A variety of multivariate techniques will be used to identify variables which best distinguish among rivers such as geographic locale, resource attributes, use character (kind and intensity), existing management problems, and experiences desired by users. The core set identified for time series analysis will be the minimum number of rivers necessary to adequately represent the spectrum of river recreation opportunities available nationwide.

Data collected through trend analysis should be valuable not only to the research community but to planners and managers as well. For example, such information will provide local administrators with insight into changes in use patterns as well as change in the characteristics and preferences of river users. Additionally, time series and cross-resource comparative analyses will provide social scientists, planners, and others a coordinated, systematic investigation into possible changes from a river basin, regional, as well as national perspective.

CONCLUSION

Several valuable products are emerging from The National River Recreation Study (1) a large and diverse data base, (2) improved data collection instruments and procedures, and (3) capability for time series and cross-resource comparative analyses. We also have developed standardized tables and data retrieval procedures for use by resource administrators and are progressing with conceptual and theoretical analyses. The research also has produced a rich interaction between researchers and managers which has improved the capability of both.

An especially rewarding product of this research so far has been the training and educational benefits resulting from the interaction among participants. Over the past 3 years especially there has been a rich, and sometimes intense, dialogue between researchers and resource administrators in setting study objectives, in creating content of the data collection instruments, in selecting environments for study, in developing sampling frameworks and procedures for field data collection, and in developing alternative strategies for analysis and information dissemination.

This dialogue and interaction has done much to increase the capability of all parties involved—and accordingly the overall quality of the research. As researchers, we have gained a greater familiarity and appreciation of the on-site problems of administrators as well as a clearer understanding of specific information needs required to effectively improve decisionmaking. On the other hand, resource administrators hopefully have gained some insights into what the products of social science research can and cannot do to solve the complex and ever-growing problems. We trust this interaction will promote and foster continued cooperation and contribute to a better understanding of river recreation management. Through this process the public will be the ultimate beneficiary.

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RECREATIONAL SATISFACTION AT BUFFALO NATIONAL RIVER: SOME MEASUREMENT CONCERNS

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Satisfaction in recreation has typically been regarded as a goal of recreational resource management. The National Park Service (NPS) organic legislation and subsequent policy statements identify visitor enjoyment and benefits as a major product of NPS management. Indeed, as Schreyer (1976) pointed out, the phrase "for the benefit and enjoyment of the people" has acted as an invisible hand to shape and guide Park Service policy.

High satisfaction in park settings is now reported regularly. This high level of satisfaction does not appear to vary with individual characteristics, expectations, places, or activities (Holland 1979). This fact has often puzzled researchers who were trying to find support for a hypothesized relation between satisfaction and some other variable (most notably, user density). It has proven even more frustrating to resource managers waiting in vain for their studies to document "problems" they thought existed.

Consistent reports of high satisfaction have led to some thought-provoking theoretical discussions of why this is so. One school of thought suggests that it is not surprising to find many people reporting high satisfaction with their leisure activities because they have freely chosen these activities to provide satisfaction (Heberlein and Shelby 1977). Cheek and Burch (1976) suggest that, because leisure is spontaneous and connotes a sense of individual freedom, either there may not be any preconceived expectations to fulfill or the expectations may be fluid and adjustable. Schreyer[1] elaborates on the psychological mechanisms that may yield reports of high satisfaction: (1) individuals may **shift their perceptions** of the experience away from original evaluations in order to maintain the desired experience, (2) individuals may **shift their priorities** of expectations to maintain satisfaction, or (3) individuals may **change their behavior** to achieve preferred outcomes that have not been attained during previous occasions.

Reports of high satisfaction have prompted others to question the usefulness of the satisfaction concept. Heberlein (1977), for example, suggests that satisfaction alone is not a suitable criterion for management because high satisfaction levels can be found even when the character of the experience changes. He proposes a normative explanation for the observed lack of a relation between user density and satisfaction. Nielsen *et al.* (1977) similarly suggest that studies may show high levels of satisfaction regardless of the total level of use because the many new users to a given area have no pre-established norm regarding acceptable levels of contacts and therefore establish the use level they find on their first visit as their norm against which satisfaction judgments will be made.

[1]*Schreyer, Richard M. 1979. Succession and displacement in River Recreation. 45 p. Paper prepared for River Recreation Project, North Central Forest Experiment Station, USDA Forest Service, St. Paul, Minnesota.*

Much research has been conducted to describe the nature of recreational satisfaction. Although a variety of approaches have been taken, several common elements can be identified in the definitions and conceptualizations of satisfaction found in the literature. Most studies that have discussed the theoretical background for recreational satisfaction have turned to the more fully developed job satisfaction literature and have concluded that discrepancy theory offers the most promising explanation (Greist 1968, Roggenbuck 1975, Graefe 1977, Holland 1979). First, discrepancy theory suggests that satisfaction is determined by the differences between the perceived outcomes a person receives and the outcomes one wants or thinks he should receive (Lawler 1972).

Second, discrepancy theory suggests that overall satisfaction in any situation is influenced collectively by the discrepancies that exist for each facet of the situation (Lawler 1972). The idea of specific satisfactions adding up in some way to produce total satisfaction (i.e. multidimensionality) is also well documented in the literature and thus seems to be a second common denominator in both theoretical and popular discussions of satisfaction (Bultena and Klessig 1969, Peterson 1974, Hendee 1974, Nielsen *et al.* 1977).

The measurement of satisfaction, however, has apparently lagged well behind its theoretical development. Some authors, recognizing the multiple components of satisfaction, have focused on some specific potential sources of dissatisfaction such as crowding or conflicts between users (e.g. Stankey 1973, Bassett *et al.* 1972). Another typical approach has been to ask recreationists to indicate overall satisfaction with their experience (e.g., Graefe 1977, Holland 1979, Roggenbuck 1975). The latter approach has produced the high satisfaction reports discussed earlier. Self reports of the importance attached to specific recreation outcomes or motivations have often accompanied such overall satisfaction ratings and have been interpreted as representing the dimensions of the experience that contribute to satisfaction. However, few studies have attempted to analytically relate specific satisfaction measures (i.e., the degree to which specific outcomes are attained) to overall satisfaction measures in a predictive sense (Greist 1968, Nielsen and Shelby 1977, Peterson 1974, Graefe 1977, Holland 1979). These latter studies have supported the notions of discrepancy and multidimensionality introduced earlier. However, the authors of these studies have generally concluded that the explanation of overall satisfaction available from specific satisfactions is insufficient and should be the topic of further research. Given that satisfaction reports from users tend to be high, it is still important for researchers to attempt to formulate the mechanisms of satisfaction and to empirically identify those variables that contribute to an explanation of satisfaction.

We feel that one reason for the inadequacy of past satisfaction studies is that little attention has been devoted to measuring the dependent variable—overall satisfaction. The usual procedure has been to ask recreationists some form of the question, "How did you enjoy your experience?" (Nielsen *et al.* 1977) and to use this single item as an indicator of satisfaction. This procedure is vulnerable because a single item offers no indication of validity or reliability. The consistency noted in past findings suggests these measures may be reliable, but the question of exactly what is being measured by these indicators remains unanswered.

Conventional Likert (summated rating) attitude scaling techniques have been used extensively to overcome this deficiency in the measurement of specific outcomes sought through recreation (e.g. Knopf 1972, Driver 1976), but these techniques appear to have been overlooked in measuring satisfaction itself. The intent of such scaling is to sample the domain of the construct being represented and measured. Herzberg *et al.* (1957) point out that differently worded questions that appear to measure the same thing can yield different results because different levels of feeling about the same subject may be tapped. If this is true, results of studies on satisfaction may be partially an artifact of the questioning used to measure satisfaction. Consequently, researchers must assess this possibility by generating multiple-item scales that quantify overall satisfaction with a known degree of reliability and comparing the performance of such scales with the types of single indicators that have typically been used.

Our first objective was to generate a multiple item attitude scale that would reliably sample and quantify the domain of overall satisfaction. Then, our second objective was to use this scale to identify the relation between specific aspects of satisfaction and the resultant measure of overall satisfaction and to compare the performance of the satisfaction scale measure as a dependent variable representing overall satisfaction with the performance of the individual scale items as dependent variables.

METHODS

The data set used to address these objectives was provided by a survey of Buffalo National River (BNR) floaters conducted during the summer of 1979. Eleven 3-day interview periods were selected between May 15 and August 15. Each day of the week was uniformly covered during the 3-month interview period.

Upon completion of the river trip, one member from each float group sampled (n = 805) was interviewed and then asked to complete a questionnaire. Each respondent answered questions designed to measure satisfaction with regard to both general (e.g., I thoroughly enjoyed the trip) and specific (e.g. I wish there had been more rapids) aspects of his or her river trip. Satisfaction statements were derived from a 14-item satisfaction scale developed by the River Recreation Research Project of the North Central Forest Experiment Station for use in their 1979 National River Recreation Study. Five general statements dealing with overall satisfaction were selected from the 14-item scale as potential overall satisfaction scale items because of their intuitive general meanings. An item analysis including calculation of item-total correlations and Cronbach alpha was conducted on the five items to identify the best combination of scale items.

To understand how well overall trip satisfaction could be explained in terms of its identifiable components, multiple regression was used with the overall satisfaction scale and its five component items as separate dependent variables. The independent variable pool included: (1) statements concerning satisfaction with specific elements of the float trip, measured on a 5-point (strongly disagree to strongly agree) response format; (2) statements concerning how well the river trip fulfilled the respondent's expectations, measured on a 6-point (terrible to excellent) response format; and (3) situational variables. The selection of these potential independent variables as indicators of satisfaction follows the discrepancy theory approach outlined earlier. The various response formats also provide some response diversity that may be useful in explaining overall satisfaction. The stepwise regression identified elements of the river trip that contributed to overall satisfaction and the extent to which overall satisfaction could be explained.

FINDINGS AND DISCUSSION

Responses to the five statements representing overall satisfaction are shown in table 1. These statements are in essence different ways of measuring the extent of satisfaction with the river trip as a whole. Notice that items 4 and 5 are negatively worded (i.e., disagreement with the statements indicates higher satisfaction). Such item reversals were intended to avoid response sets. All but one of the five items received response patterns indicating high trip satisfaction and thus repeating the findings in previous studies. Item 2, on the other hand, received a more neutral response with an even extent of agreement and disagreement. This is not surprising because item 2 posed a more demanding satisfaction question by asking respondents to compare their trip to the best trip they could imagine. The item means suggest that the five items represent the neutral to high range of the overall satisfaction continuum.

Reliability statistics (item-total correlations and Cronbach alpha) calculated for the summated rating scale comprised by these five items are also given in table 1. Together the five statements produced the best measure of overall satisfaction available from any subset of the five items. Deleting any single item from the scale would lower the remaining scale's standardized alpha. Item 2 is the weakest member of the scale as seen by its low item-total correlation coefficient and the smallest reduction in alpha if it was deleted from the scale. However, item 2 was retained in the scale because of its contribution to scale reliability and because it was the only scale item that sampled the neutral range of the satisfaction domain.

Stepwise regression analysis was then used to determine the importance of each element in explaining the variance in overall satisfaction—the overall satisfaction scale was the dependent variable and selected situation variables, trip fulfillment scores, and specific satisfaction statements were independent variables (table 2). Nine items accounted for 39 percent of the variance in overall satisfaction. About 20 percent of the variability was attributable to the level of agreement with the statement, "I was very pleased with the scenery". To what degree the float trip was able to fulfill the "opportunity to have thrills and excitement" explained another 8 percent of the variance. The level of agreement with the statement "I was pleased by the job being done by managers of the river" accounted for another 4 percent of the variance.

Table 1.—*Overall satisfaction scale item composition*

Scale item	Frequency of responses (percent)					N	Item mean	Standard deviation	Corrected item—total correlation	Alpha[1] if item deleted
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree					
1. I thoroughly enjoyed the trip	1	2	3	50	44	798	4.35	0.6689	0.4521	0.6385
2. I cannot imagine a better river trip	6	27	32	26	9	789	3.02	1.0583	0.3889	0.6679
3. The river trip was well worth the money I spent to take it	1	3	9	60	27	787	4.11	0.7112	0.4722	0.6286
4. I do not want to run any more rivers like this one	41	47	8	3	1	788	1.77	0.7916	0.4615	0.6278
5. I was disappointed with some aspects of my trip	22	37	19	20	2	785	2.42	1.0876	0.4981	0.6119

[1]Alpha = 0.7041

Table 2.—*Results of regression of selected independent variables on the overall satisfaction scale*

Independent variable	B	Standard error B	F	Cumulative R^2
I was very pleased with the scenery	0.2511	0.0314	64.08	0.2051
Opportunity to have thrills and excitement	0.1062	0.0178	35.75	0.2893
I was pleased by the job being done by managers of the river	0.1151	0.0243	22.52	0.3275
Opportunity to get away from the usual demands of life	0.1086	0.0224	23.54	0.3476
The number of people I saw on the river bothered me	0.0903	0.0203	19.75	0.3614
I wish there had been more rapids	0.0762	0.0205	13.83	0.3728
The river went through some very wild country	0.0459	0.0173	7.04	0.3786
About how many canoes passed you on the river today	0.0023	0.0010	5.75	0.3831
I thought the river and its surroundings were in good condition	0.0610	0.0277	4.85	0.3875
(Constant)	(0.5365)			

Tables 3 through 7 present the results of similar regression analyses conducted with each of the individual satisfaction scale items as the dependent variable. None of the coefficients of determination (R^2) for the five single items approached the 0.39 R^2 of the overall scale. However, items 1 and 3 achieved an R^2 of 0.30 and 0.33, respectively. In addition, no consistent order was found of variable entry into the regression equations across all five items and the overall scale. This is an important point because if the overall satisfaction indicators all measured the same thing, the same variables, in roughly the same order, would occur in each regression analysis.

Items 1 and 3 and the overall scale shared several of their first five variables. Most noteworthy was the large contribution the scenery variable made to the total R^2 value of each of the three regressions. In each case, this variable accounted for more than half of the variance. From an intuitive standpoint the similarities in extent of explanation and selection of variables between the overall scale and items 1 and 3 make sense. A response to either of these two single items does not ask the respondent to compare his float trip to some ideal trip as in item 2 or to compartmentalize different aspects of his trip as in item 5. Both relate to the overall trip in general. Hence, the same variables are found to explain most of the variance in each of these items and the overall scale, and the amount of variance accounted for by items 1 and 3 is the highest for any single item indicator.

Examining the regressions on satisfaction items 2, 4, and 5 leads to several observations. First, when satisfaction is measured by comparing the present river trip to some hypothetical "better trip" as in item 2 (table 4), different variables become important in explaining variability. The opportunity to have thrills and excitement was found to be the most important indicator of how closely the actual trip approached the ideal trip. Entry of the variable, "I wish there had been more rapids," at the third step futher supported the role of challenging water conditions in the image of the ideal river trip.

Similarly, satisfaction item 5, which required respondents to think in terms of the various aspects of their trip, was best explained by a still different array of independent variables (table 7). In this case, the number of people encountered on the river was an important independent variable. Notable in this regression was the small amount of total variance accounted for and the small R^2 attributable to the first variable to enter the equation.

Satisfaction item 4 incorporated a hypothetical behavioral dimension to overall satisfaction with its reference to future river trips (table 6). The selection of independent variables showed no unique departures from the pattern established by the overall scale and items 1 and 3, but the coefficient of determination was much lower ($R^2 = 0.13$).

Table 3.—*Results of regression of selected independent variables on scale item 1: I thoroughly enjoyed the trip*

Independent variable	B	Standard error B	F	Cumulative R^2
I was very pleased with the scenery	0.2948	0.0372	62.75	0.1822
Opportunity to have thrills and excitement	0.1238	0.0221	31.37	0.2540
Opportunity to get away from the usual demands of life	0.1075	0.0275	15.32	0.2702
I was pleased by the job being done by managers of the river	0.1018	0.0286	12.62	0.2846
How did the number of people you saw today affect the overall enjoyment of your float trip	0.0589	0.0183	10.39	0.2952
(Constant)	(1.4410)			

Table 4.—*Results of regression of selected independent variables on scale item 2: I cannot imagine a better river trip*

Independent variable	B	Standard error B	F	Cumulative R^2
Opportunity to have thrills and excitement	0.2382	0.0378	39.70	0.1322
I was pleased by the job being done by managers of the river	0.1093	0.0482	5.15	0.1604
I wish there had been more rapids	0.2214	0.0406	29.71	0.1868
The river went through some very wild country	0.1501	0.0336	19.90	0.2082
The people I saw on the river did not bother me	0.1428	0.0443	10.40	0.2238
About how many canoes passed you on the river today	0.0110	0.0026	17.54	0.2366
I was very pleased with the scenery	0.1507	0.0609	6.12	0.2442
Opportunity to share what I have learned with others	0.1215	0.0395	9.45	0.2504
About how many canoes on the bank and in the water did you pass on the river today	–0.0044	0.0020	5.02	0.2559
I thought the river and its surroundings were in good condition	0.1157	0.0565	4.19	0.2608
Opportunity to be a part of a group	–0.0707	0.0366	3.74	0.2649
(Constant)	(–1.0600)			

Table 5.—*Results of regression of selected independent variables on scale item 3: The river trip was well worth the money I spent to take it*

Independent variable	B	Standard error B	F	Cumulative R^2
I was very pleased with the scenery	0.3959	0.0384	106.20	0.2473
To get away from the usual demands of life	0.1410	0.0271	27.04	0.2815
I was pleased by the job being done by managers of the river	0.1342	0.0301	19.91	0.3113
The river went through some very wild country	0.0648	0.0213	9.23	0.3195
How did the number of people you saw today affect the overall enjoyment of your float trip	0.0415	0.0182	5.20	0.3251
I thought the river and its surroundings were in good condition	0.0675	0.0346	3.81	0.3288
(Constant)	(0.5802)			

Table 6.—*Results of regression of selected independent variables on scale item 4: I do not want to run any more rivers like this one*

Independent variable	B	Standard error B	F	Cumulative R^2
I was very pleased with the scenery	0.2955	0.0481	37.79	0.0930
Opportunity to get away from the usual demands of life	0.1383	0.0345	16.10	0.1141
I thought the river and its surroundings were in good condition	0.1225	0.0448	7.47	0.1192
The people I saw on the river did not bother me	–0.1259	0.0391	10.40	0.1254
The number of people I saw on the river bothered me	0.0937	0.0345	7.38	0.1347
(Constant)	(1.9672)			

Table 7.—*Results of regression of selected independent variables on scale item 5: I was disappointed with some aspects of my trip*

Independent variable	B	Standard error B	F	Cumulative R^2
The number of people I saw on the river bothered me	0.1938	0.0461	17.68	0.0558
I was pleased by the job being done by managers of the river	0.1962	0.0506	15.05	0.0935
Opportunity to have thrills and excitement	0.0826	0.0389	4.52	0.1169
I wish there had been more rapids	0.1943	0.0440	19.53	0.1334
I was very pleased with the scenery	0.2072	0.0659	9.90	0.1501
Opportunity to get away from the usual demands of life	0.1402	0.0481	8.49	0.1583
The rivers went through some true wilderness	–0.1032	0.0404	6.53	0.1664
About how many canoes on the bank and in the water did you pass on the river today	0.0032	0.0015	4.37	0.1718
How did the number of people you saw today affect the overall enjoyment of your float trip?	0.0701	0.0345	4.12	0.1768
(Constant)	(–0.0957)			

IMPLICATIONS

If the overall satisfaction scale is an improved measure of satisfaction and the theoretical reasoning behind the independent variables is valid, one would expect a better predictive model for the satisfaction scale than for single satisfaction indicators. The lower coefficients of determination obtained for individual items would then be largely a function of the unique item variance associated with the individual items.

This explanation of the findings of this study leads to some practical implications for interpreting past satisfaction studies and designing future ones. The greatest inconsistencies in the predictive models for the various dependent variables were found for those that were most "innovative," or most divergent in question wording from typical questions assessing overall satisfaction. Relating this to the earlier discussion of psychological responses associated with satisfaction (Schreyer 1979) reinforces the idea that overall satisfaction is complex, nebulous, and fluid to recreationists. When questions provide greater detail or structure concerning what is meant by satisfaction, as in questions introducing an ideal trip (item 2) or an expectation to repeat the type of trip (item 4) or the idea of thinking of the trip in terms of its aspects (item 5), specific unexpected reactions were evoked. The best predictors for overall satisfaction were no longer the best predictors for some of these indicators.

Instead of muddying the waters, this finding introduces some new possibilities. The use of such innovative satisfaction statements is advantageous because it represents different subdimensions and different levels of feeling about satisfaction. Although the lowest R^2 values were found for the more innovative dependent variables, it should be recognized that these are the types of variables that tap the previously unexplored ranges of the satisfaction continuum. Inclusion of these statements in the satisfaction scale resulted in the best predictive model available, suggesting that the items collectively provided the most comprehensive and realistic measure of overall satisfaction.

Implications of these findings for measuring satisfaction in future studies depend in large part on how satisfaction is to be conceived. If satisfaction is conceptualized as a general disposition, using a measurement scale is clearly advantageous over using single item indicators. Increased experimenting with these and other scale items can lead to improvements in both scale reliability and range. Devoting greater attention to the development of innovative satisfaction indicators will be especially helpful in sampling the domain of overall satisfaction. In addition to their scale contribution, new scale items may less ambiguously describe particular subdimensions of overall satisfaction.

Use of this overall satisfaction scaling approach is not dependent upon nor mutually exclusive of determining the multiple components of total satisfaction in a given situation. The regression analyses reported here support the theory that overall satisfaction is influenced by satisfaction with specific aspects of the experience. However, the observed extent of explanation of the variance ($R^2 = 0.39$) leaves room for improvement in the model. Studies concerned with identifying the variables that contribute to understanding satisfaction would benefit from increased attention to the development of potential independent variables. Additional improvements in the model might also be obtained through further data analysis. For example, the models presented reflect the full heterogeneity existing in the study population. They are, in effect, averages. Recognizing that satisfaction means different things to different people, we might hypothesize that explanation of satisfaction can be enhanced by identifying and formulating separate predictive models for more homogeneous groups of river floaters.

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ATTRACTION OF RECREATIONISTS TO RIVERS: A NATIONWIDE VIEW

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INFORMATION NEEDED BY RIVER MANAGERS

River recreation has grown remarkably in this country in recent years and has become a major American outdoor activity (USDA Forest Service 1977). Unless energy costs and shortages and economic malaise create major disruptions, the trends are likely to continue. Unfortunately, for the growing number of enthusiasts in search of free-flowing streams and backcountry solitude, the supply is limited.

Most of the really desirable rivers run through public land. In most of those locations the demand for services and facilities and the impacts of recreational use have grown to the point that the rivers and their users now must be managed to ensure safety and sanitary conditions, to ameliorate conflict, and to prevent the quality of the resource from being damaged unacceptably. When navigable rivers pass through private land, government intervention is often required and justified for the same reasons.

The people who have the job of managing rivers for recreation have a great need for information. Specifically, they need answers to the following questions:

- What is the potential demand for different uses of a river?
- How important or valuable is a river for various kinds of use?
- What are the trends in use, particularly with respect to energy or economy-related changes in willingness to pay and willingness to travel?
- What are the social and personal benefits of river recreation?
- Is a given river a resource of local, regional, or national significance? Do local users come to the river for different reasons than people who travel greater distances? Is the river more or less important to them?
- How unique is the river? Is it a scarce resource or simply one of many? What are the competing alternatives?
- How efficient is the river's location vis-a-vis potential users? Are more efficient alternatives available that might be encouraged?
- What are the specific characteristics of the river that attract its users? What are the purposes or motives that draw people to the river?
- How sensitive are different types of users to conditions of the resource and to management actions?
- What are the impacts on the public of rationing and allocation schemes? How are those impacts distributed geographically and socially? Who benefits and who loses economically when allocation and rationing schemes are imposed? Do those schemes create the opportunity for abnormal profits for commercial users?
- Where does a particular river fit in a nationwide system of recreation opportunities?

The purpose of this paper is to show how methods of travel demand analysis can be used to help provide answers to these questions.

THE INFORMATION CONTAINED IN TRAVEL CHOICES

When stripped of their situational idiosyncrasies, most of the questions raised above boil down to the following:

1. What choices will people make under various circumstances?
2. What will change as a result of those choices?
3. What variables in the process can and should be controlled by the manager?

River recreation management is largely a matter of predicting behavior, predicting the impacts of behavior, and designing and implementing interventions to modify behavior and/or its impacts (Peterson and Lime 1979).

Much research has been devoted to these problems, many different methods have been used, and much useful information has been generated. However, we feel that there has been little theoretical reasoning and not enough scientific observation of real choices. No one yet has figured out how to get atoms and molecules to fill out questionnaires, but the sciences of chemistry and physics have made good progress in spite of this.

Much can be learned from the recreational travel choices that people make. Travel is generated by a decision process that has been explained and modeled in a variety of ways in the transportation demand literature (Stopher and Meyburg 1975). Except when the travel itself is the object of recreation, the decision process can be simplified as a tradeoff between the attractiveness of alternative destinations and the cost of the travel. This assumes that a decision has been made already to engage in a recreational activity that creates a need for the kind of services and resources available at alternative destinations.

Several factors are involved in the site choice:

(1) The importance or value of the activity one wants to engage in, e.g., skiing, fishing, canoeing, etc.[1]

(2) The quality of the facilities, resources, and services available at alternative locations.

(3) The impedance or travel cost separating the individual from each of the possible destinations.

Personal variables such as age, sex, personality, past experience, occupation, and income, will influence the value one places on the activity. Site characteristics and personal variables will modify the perceived quality of the site for that activity. Distance, mode of travel, and personal variables will modify the magnitude of the travel impedance. Thus, careful observation and analysis of travel choices can reveal information about the person, the activity, the site, and the impedance. A framework of theory and method is required, however, if the intricately interwoven effects are to be isolated. Two approaches are considered here: site attractiveness modeling and site choice modeling.

SITE ATTRACTIVENESS MODELING

Site attractiveness modeling looks at the ability of a site to attract visitors from the surrounding area. It attempts to explain the number of visitors attracted from various areas in terms of (a) characteristics of the site. (b) the purpose of the visit, (c) the distance traveled, (d) the population density and other demographic variables at the trip origin, (e) personal characteristics of the visitors, and (f) the supply of competing opportunities. The key point in site attractiveness modeling is that the analysis is done from the point of view of a specific site in order to understand its relation to the market and the process by which it attracts its visitors.

In its simplest form such analysis might begin with assumptions such as (1) the site has no competitors, (2) all visits are for the same single purpose, (3) the population at any specific trip origin is homogeneous with respect to personal and demographic variables to which the recreational travel decision might be sensitive, and (4) all areas in which trips originate are identical except for population density and distance from the site. Of course, such assumptions will never be true, but they provide a background for a simple illustrative model.

[1] *If the object of the paper were to develop a theory of recreational choice, we would want to back up several steps and deal with situational variables and with needs, motives, and expected outcomes before moving to activity choice (Peterson et al. 1978). We would also want to explore the sequence in which various decisions occur. However, for the sake of simplicity it is assumed that the process begins with activity choice and then goes to site choice.*

Let the area from which potential visitors to a river are attracted be divided into a set of discrete zones, i = 1,2,....,n, and define

V_i = the number of visits observed from zone i

Z_i = the total population of zone i

$\sum_{i=1}^{n} V_i$ = the total number of visitors observed at the site from all zones, and

D_i = the distance from zone i to the site.[2]

If the V_i are sampled randomly and represent the distribution of visits from all zones, then

$$\left\{ \frac{V_i}{\Sigma V_i} \right\} = p(i), \tag{1}$$

where p(i), is the probability that a randomly observed visit at the site is from zone i. If the population of zone i is homogeneous, the conditional probability that a visit is person k from zone i, given that the visit is from zone i, is

$$p(k/i) = \frac{1}{Z_i} . \tag{2}$$

If the population is not homogeneous,

$$\varepsilon \{p(k/i)\} = \frac{1}{Z_i} . \tag{3}$$

Given homogeneity at the origin, the probability that a visitor is person k from zone i is

$$p(ki) = p(i) \cdot p(k/i) \tag{4}$$

$$= \varepsilon \left\{ \frac{V_i}{Z_i \Sigma V_i} \right\}. \tag{5}$$

The object of the analysis is to explain p(ki), as given by Eq. (5), as a function of the impedance (distance, travel time, travel cost, etc.) between the zone and the site. A simple plausible form for the relation is

$$p(ki) = \varepsilon \left\{ \frac{V_i}{Z_i \Sigma V_i} \right\} \simeq \alpha \, D_i^{-\beta} . \tag{6}$$

To preserve the properties of probability the following must be true:

$$\sum_{i=1}^{n} \sum_{k=1}^{Z_i} \alpha \, D_i^{-\beta} = 1, \tag{7}$$

which implies

$$\alpha = \frac{1}{\sum_{i=1}^{n} Z_i D_i^{-\beta}} \tag{8}$$

and the complete function becomes

$$p(ki) = \varepsilon \left\{ \frac{V_i}{Z_i \Sigma V_i} \right\} \simeq \frac{D_i^{-\beta}}{\sum_{i=1}^{n} Z_i D_i^{-\beta}} ; \text{ or} \tag{9}$$

$$p(i) = \varepsilon \left\{ \frac{V_i}{\Sigma_i V_i} \right\} \simeq \frac{Z_i D_i^{-\beta}}{\sum_{i=1}^{n} Z_i D_i^{-\beta}} . \tag{9a}$$

In Eq. (6), the exponent is the distance elasticity of p(ki) in the presence of the existing supply of competing opportunities. It can be estimated in Eq. (9) by maximum likelihood methods. However, a reasonable approximation can usually be obtained for from Eq. (6) using ordinary least squares regression.

In practical applications, the simple models given by Eqs. such as (6) and (9) are generally able to explain a significant portion of the variance in the number of visitors arriving from different zones. However, the assumptions of intra- and interzone homogeneity are unrealistic. Within a zone, individuals may vary with regard to their likelihood of visiting the river. This variance can be explained, in part, by measurable personal variables. It is also likely that significant differences will exist among zones in addition to differences in distance and size to population. Some of those differences may be social, economic, or cultural in nature while others may stem from the locations of intervening opportunities. In short, it is possible to substantially improve the model by specifying it in terms of more variables that describe interpersonal and interzonal variables.

Disaggregate formulation of the model with the individual trip as the observation (rather than the aggregate zone) allows the further inclusion of differences in perception and importance of site attributes. Of course, the model given in Eqs. (6) and (8) makes some demanding assumptions and is only one of several possibilities. It should be evaluated thoughtfully in any given application.

Other things being equal, the exponent β will vary with:

(1) the importance of the activity for which the site is used,
(2) the attractiveness or "quality" of the site for the activity in question,
(3) the cost or "price" of distance, and
(4) the quality and location of competing sites, should the assumption be untrue.

[2] *For a specific application it may be advantageous to define this as travel time or actual travel cost or to stratify it by travel mode.*

The coefficient in Eq. (7) varies with β and with the locational efficiency of the site. Given a fixed value of β for a particular activity, site, and type of person, then $1/\Sigma Z_i D_i^{-\beta}$ measures differences in locational efficiency.

Much useful information can be generated with cautious application of this type of site-specific analysis. One such application is the estimation of trip "demand" functions to evaluate willingness to pay for a site (Dwyer *et al.* 1977). Another is to compare the value of a site for several different activities for which it might be used (recognizing that differences in the value of the site may reflect differences in supply conditions and distribution of client populations as well as differences in site characteristics).

Changes in the cost of travel and in the willingness to travel would be reflected in changes in β. Related to the uniqueness of a site is the question of whether it is important locally, regionally, or nationally. This can be examined quantitatively by means of site attractiveness modeling. Differences in the meaning of a site to different segments of the population can also be exposed. It must be recognized, however, that this kind of model is heuristic and empirical. It describes the trip-attraction of a site, but "demand" interpretation should be done cautiously for reasons discussed in a later section.

The following two subsections illustrate application of site attractiveness modeling. The first is a hypothetical exploration of the impacts of site rationing. The second is an empirical description of several rivers studied in 1977 as part of the National River Recreation Study.

An Illustrative Theoretical Application: The Impact of Rationing

One important problem to which attractiveness modeling can be applied is the impact of rationing. Assume that a daily carrying capacity has been defined for a given whitewater river and that demand greatly exceeds supply. A lottery is therefore established to assign available "trip-days" among applicants. Assume the lottery ratio is 1:2 (for every two applications only one permit can be granted).

A crucial question is whether the willingness to submit an application is the same as the willingness to travel to the river. It seems reasonable to assume there might be a greater propensity to submit an application in anticipation of a possible trip than to travel to the river if a permit is granted. In other words, "β" for the application process might be different than "β " for the actual travel process.

In figure 1, Curve A is a hypothetical applicant function, with the number of applicants per capita on the vertical axis and the distance to the site on the horizontal axis. Curve B is then the number of permits granted per capita as a function of distance at the 1:2 lottery ratio. Let Curve C be the actual number of visits per capita that would arrive from various distances without rationing. The relation between Curve A and Curve C implies the distance elasticity of applications is less than the distance elasticity of travel to the site. In general, more people apply than are willing to travel.

If this assumption is correct, then:

1. The "no-show" rate may tend to increase with distance from the site.

2. The likelihood of being denied a permit may increase with decreasing distance. In other words, local users may be discriminated against. A possible interpretation of this, based on economic theory, is that higher valued and more specialized uses may tend to be favored and a higher percentage of lower-valued uses may tend to be denied. This would be an implied policy redefining the "purpose" of the resource.

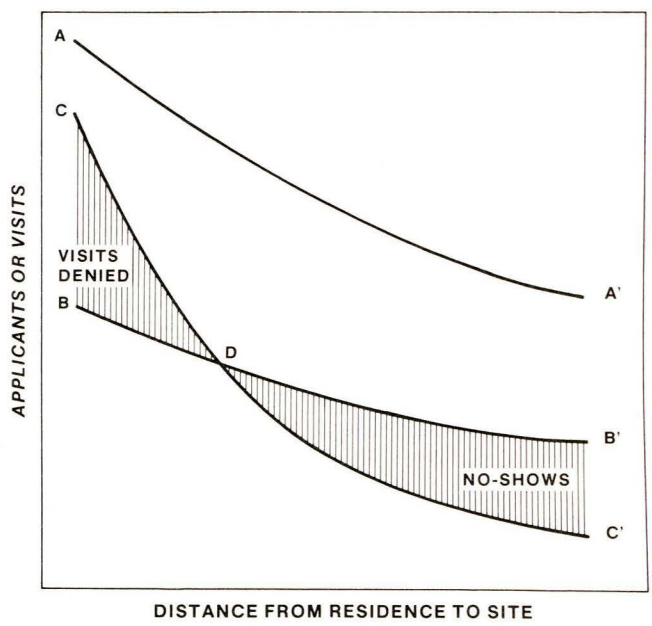

Figure 1.—*Potential geographic impacts of lottery rationing.*

3. Actual use resulting from the rationing system may fall below the permitted capacity because permits assigned to people unwilling to travel will go unused. Thus, it may be desirable to increase the lottery ratio until the actual use rate achieves capacity.

4. It may be desirable to formalize a "hovering" policy whereby people are encouraged to obtain "no-show" permits at the site on a first-come-first-served basis. This substitutes "willingness to wait and take risk" for "willingness to travel" and tends to redistribute "no-show" permits to local users.

5. It may be desirable to consider an application fee or deposit that is forfeited if a permit is not used. This would modify the elasticity of the application process (Curve A in fig. 1) and perhaps bring it more in line with the actual travel process (Curve C).

The distributional impacts hypothesized above may or may not be desirable. However, if the rationing system is designed on an *ad hoc* basis at the local level without explicit analysis of these issues, there may be implied *policy* that ought to have been resolved politically or perhaps administratively at more general levels in the agency.

Attractiveness modeling offers a tool for explicit analysis of these questions. Analysis of application, permit, and actual trip data can reveal the size of the "no-show" population, how far people are willing to travel, etc.

The possibility of secondary impacts of lottery rationing is suggested by this kind of analysis. Assume the river has no substitutes. Limiting supply through lottery rationing may create unsatisfied demand so people may be willing to pay more than the required travel cost. If use is also allocated between the private sector and the commercial operators who outfit and guide river trips, the people who applied for private trips but were turned away by the lottery would have the option of purchasing the services of a commercial operator. Many of these people may be willing to pay more than their travel cost and the normal cost of services and equipment. If the commercial capacity is reached, as with some western whitewater rivers, the unsatisfied private demand might begin to bid up prices beyond a normal charge for services. In effect, this would be a transfer of consumers' surplus from the private sector to abnormal profits in the commercial sector.

It is not our purpose to imply such impacts of river resources rationing are occurring or to predict that they will occur in the future. Rather, rationing is an example of river management action that is taking place in an ad hoc fashion, perhaps without explicit knowledge of all the impacts. Information about the processes by which applications and trips are generated can help clarify the impacts through attractiveness modeling. The potential impacts described above are illustrative of what might happen, given some assumptions about demand.

An Illustrative Empirical Comparison of Several Rivers

Since the summer of 1977 the National River Recreation Study has been collecting data about the recreational use of numerous rivers. The data include information on the points of origin of trips to the river as well as other descriptive details about visits. Trip-origin data have been used in a preliminary "site attractiveness" analysis of 12 rivers: Mohican (Ohio), Hiwassee (Tennessee), Ocoee (Tennessee), Deschutes (Oregon), Apple (Wisconsin), Illinois (Oklahoma), Nantahala (N. Carolina), Upper Colorado (Colorado), Upper Missouri (Montana), Main Salmon (Idaho), the Middle Fork of the Salmon (Idaho), and the Chattooga (S. Carolina/Georgia) (table 1).

Results displayed in table 1 should be regarded as illustrative. They were obtained by ordinary least squares regression estimates of the logform of Eq. (6). Work in progress is exploring complete estimation of Eq. (9) by maximum likelihood methods for a larger set of rivers (including rivers studied in 1978 and 1979).

Strong differences exist among the 12 rivers with regard to β, average distance traveled, and average distance from the people.[3] The Main Salmon and the Middle Fork show the least sensitivity to distance and tend to attract visitors from much farther away. These were the only rivers in the study under permit rationing at the time the data were collected. Geographical shifts in trip origins would tend to produce the kinds of differences observed in β and average distance traveled. However, these rivers also are a different kind of resource than most of the others in that they are "wilderness" whitewater rivers requiring about 5 days to float. With the exception of the Missouri River, which is a long multiple-day flat water river, the rivers are generally used for day-trips. The required trip length would tend to make

[3] *The average distance traveled if every person in the country made one trip to the river. This is not the distance from the population centroid.*

Table 1.—*Preliminary Estimation of "β" for 12 Rivers*

River	– "β"[1]	Average distance[2] traveled	Average distance[3] from the people	Observations	R^{2}[4]
		—Miles—		No.	
Mohican	–2.64	76	722	444	0.84
Hiwassee	–2.87	94	771	128	0.86
Ocoee	–2.61	97	769	280	0.88
Chattooga	–2.26	156	787	9,877	0.73
Deschutes	–2.48	164	1,743	456	0.80
Apple	–2.03	166	880	191	0.75
Illinois	–2.27	166	856	226	0.79
Nantahala	–2.08	259	770	87	0.70
Colorado	–2.02	266	1,177	2,169	0.80
Missouri	–3.03	268	1,416	497	0.91
Main Salmon	–1.78	822	1,591	175	0.74
Middle Fork	–1.81	873	1,508	191	0.70

[1]As estimated by least squares in the log form of Eq. (6).

[2]Based on one-way airline distance between points.

[3]The average distance travelled if every person in the country made one trip to the river.

[4]Fraction of the variance among zones explained by the estimate of Eq. (6).

the Main Salmon, Middle Fork, and Missouri Rivers more the object of major vacations; and, this also would tend to produce the kinds of differences observed in β and average distance traveled.

When data become available on a large number of rivers nationwide, it may eventually be possible to explain differences in β and average distance traveled in terms of such variables as (1) characteristics of river and river setting, (2) river location, (3) type of use, (4) duration of visit, (5) management policy (e.g., rationing), and (6) intervening opportunities. It also is likely that Eq. (6) is under-specified, and adding more variables might improve explanation. For example, the geographic distribution of prediction errors for the Upper Colorado River clearly shows that they are not randomly distributed about the country (fig. 2). This implies possible effects of other variables such as geographically selective marketing strategies, demographic and/or cultural differences, and competing opportunities.

SITE CHOICE MODELING

Attractiveness modeling produces useful information for a specific river; but, in the simple form presented above, it cannot evaluate the role of that river in the process that allocates demand among all rivers nationwide. Site choice modeling is a way to look at the allocation of demand to a specific river in the context of a national system of rivers.

To illustrate the concept by means of an aggregate model, assume the nation can be divided into geographic zones. Each zone i delivers V_{ij} visits to river j.

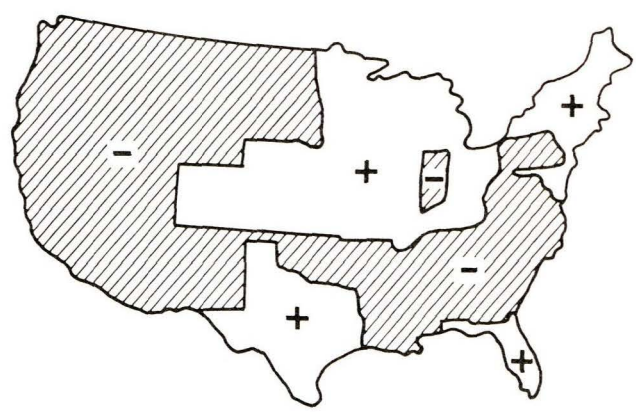

Figure 2.—*Geographic distribution of prediction errors for the Upper Colorado River in central Colorado.*

⊞ = *portions of the country that generate more trips than the model predicts and*

⊟ = *portions of the country that generate fewer trips than the model predicts.*

Let the rivers in the set containing j be substitutes and exhaustive of all rivers in the nation of that type. Now define

$P_i(j/i)$ = The probability that a person in zone i will choose destination j.

Site choice modeling attempts to explain this probability in terms of (a) variables describing the persons and/or zones, (b) variables such as distance describing the relation of the persons and zones to the rivers, and (c) attributes describing the rivers (such as physical, biological, and social conditions).

The approach generally used for site choice modeling is multinomial logit analysis, which may be formulated as follows:

$$P_i(j/i) = \frac{e^{U(D_{ij}, X_j, d_j)}}{\Sigma_k e^{U(D_{ik}, X_k, d_k)}} \qquad (10)$$

where $U(D_{ij},X_j,d_j)$ is the utility function describing the value or utility of river j,

D_{ij} is a vector of variables describing travel impedance from i to j (such as distance, travel time, travel cost),

X_j is a vector of attributes describing the rivers, and

d_j is a set of destination-specific dummy variables that capture specification and sampling errors.

Eq. (10) is an aggregate formulation if the population of zone i is homogeneous. In this model the zone is the observation. Socioeconomic differences among individuals and/or zones would be captured as interaction variables by population segmentation. The model also has a disaggregate form in which the individual would be the observation.

The primary purpose for including this material on site-choice modeling is to help put the attractiveness model discussed earlier in its proper context. However, the site-choice or trip distribution problem is interesting by itself. Work in progress is using National River Recreation Study data from 1977, 1978, and 1979 to test and estimate a specific form of Eq. (10). This kind of analysis contributes to an ability to predict demand and estimate benefits for a given river in the context of a larger system of river opportunities. The sensitivity of demand to factors such as energy cost can be evaluated and trends over times can be observed.

LIMITATIONS OF EMPIRICAL SITE ATTRACTIVENESS MODELING

The site-choice model is a "trip-distribution" model that allocates trips among alternative destinations, given trip demand at the origins. The logit model (Eq. 10) is derived by the criterion of utility maximization, given the utility function and certain assumptions about the process. Thus, it can be regarded as a demand function from which demand distribution elasticities can be calculated for the variables in the utility function.

Such a site-choice model does not deal with the amount of demand generated, however. The problem is clarified by deriving a site-attractiveness model for a single site, in the presence of many sites, from the site choice model. For simplicity, let the trip-distribution component of the utility function be U_1 with the understanding that it contains the relevant variables to which utility is sensitive in site choice. Let the site-choice probability be p(j/i), the probability that a trip originating at origin i will choose destination j. Let the site-attractiveness probability be p(i/j), the probability that a trip observed at destination j originates at origin i.

Given the assumption of logit theory, the utility-maximizing site choice model is

$$p(j/i) = \frac{e^{U_1}}{\Sigma_j e^{U_1}} . \qquad (11)$$

The number of trips from i to j is

$$V_{ij} = p(j/i)\Sigma_j V_{ij} = \frac{e^{U_1}}{\Sigma_j e^{U_1}} \Sigma_j V_{ij}, \qquad (12)$$

where $\Sigma_j V_{ij}$ is the total number of trips generated at origin i.

Assume that trip generation can be described as a function of U_2, the trip generation component of the utility function:

$$V_{ij} = \frac{e^{U_1}}{\Sigma_j e^{U_1}} f_i(U_2) . \qquad (13)$$

Eq. (13) is a site-demand function. The general site attractiveness model is

$$p(i/j) = \frac{V_{ij}}{\Sigma_i V_{ij}} = \frac{\frac{e^{U_1}}{\Sigma_j e^{U_1}} f_i(U_2)}{\Sigma_i \{\frac{e^{U_1}}{\Sigma_j e^{U_i}} f_i(U_2)\}} \cdot \quad (14)$$

If U_1 and U_2 are separable and independent components of the consumer utility, trip generation and trip distribution can be analyzed as independent demand processes.

Eq. (13) is the form of a model proposed by Cesario and Knetsch (1976). Their model can be expressed as

$$V_{ij} = \{\frac{A_i^{b_2} \exp(b_3 C_{ij})}{\Sigma_k A_k^{b_2} \exp(b_3 C_{ik})}\} b_o P_i \{\Sigma_k A_k^{b_1} A_k^{b_2} \exp(b_3 C_{ik})\}^{b_4 + 1}$$

where P_i = population or origin i,
A_j = attractiveness of destination j,
C_{ij} = generalized travel cost from i to j, and
$b_o \ldots b_4$ = estimated parameters.

For utility maximization, their distribution function implies

$$U_1 = b_3 C_{ij} + \ell n\, A_j^{b_2} \cdot \quad (16)$$

The trip generation portion of the model is a function of the logit function denominator, which is a generalized measure of utility, vis-a-vis each origin, in terms of the quality of all sites and the accessibility of the origin to those sites.

Although the trip generation portion of the Cesario and Knetsch model is apparently an empirical form and not a utility-maximizing demand function, it implies, as we would intuitively expect, that U_2 is sensitive to the variables in U_1. This further implies that generation and distribution of demand are not independent, although U_1 and U_2 may be separable.

The following conclusions are important:

1. When the site being analyzed has no substitutes, the trip distribution function degenerates to unity and the site demand function is the trip generation function.

$$V_{ij} = f_i(U_2) \quad (17)$$

and

$$V_j = \Sigma_i f_i(U_2) \cdot \quad (18)$$

In such a case, the site attractiveness function is

$$P(i/j) = P(i) = \frac{f_i(U_2)}{\Sigma_i f_i(U_2)} \cdot \quad (19)$$

This is the form of Eq. (9a), a version of the illustrative simple attractiveness model described earlier, in which it is implied that

$$f_i(U_2) \simeq g(x) Z_i^{-\beta} D_i \quad , \quad (20)$$

where g(x) is some function of the attributes of the site. Note that g(x) factors out and disappears in Eq. (9), (9a), and (20) and therefore is irrelevant in those equations. If Eq. (20) is a correct specification and Eq. (9) is estimated by unbiased methods, β can be compared between different sites that do not have competitors. It provides information about the sensitivity of attractiveness to distance.

2. When competing sites are present but U_1 contains no origin-conditional information, the trip-distribution function factors out of Eq. (15). The site attractiveness function again simplifies to Eq. (20). However, trip generation may be a function of total supply (the denominator of the distribution function), as in the Cesario-Knetsch model. If so, complete knowledge of the attributes of competing sites still is required.

3. When U_1 contains origin-conditional information (such as distance) and competing sites exist, the more general Eq. (15) should be used for complete site attractiveness analysis. In this case the analysis of a specific site requires knowledge of the relevant attributes of *all* competing sites and the trip generation function for all origins in the presence of all competing sites.

4. When competing sites are present and trip distribution is sensitive to origin-conditional variables such as distance, a model like Eq. (9) is a heuristic description of an empirical relation between trip attraction and distance (and/or other variables that might be included). It can be regarded as a conditional site attractiveness function. It is conditional on other variables being held constant, such as the location and attributes of the site in question and the location, number, and attributes of competing sites. Therefore, it is *not* generalizable from one site to another. It describes only the site in question under the conditions prevailing when the data were collected. Still, information thus presented is useful to the managers of that site if the limitations are understood.

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USER PERCEPTIONS OF RIVER RECREATION ALLOCATION TECHNIQUES

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Recreational use limits of some kind have been implemented on about 45 river segments in the United States (McCool 1978, McCool *et al.* 1977). Although most river floaters accept the necessity of such limits (Roggenbuck and Schreyer 1977), the question of how to allocate limited use opportunities remains a controversial one. Historically, river managers have employed allocation policies that differentiate between commercial users (who pay outfitters to provide boats, guides, food, and equipment necessary for a float trip) and private users (who float a river with their own equipment and expertise). The principal question associated with such policies is: "How should use be divided between these two sectors?" A subsequent management problem centers around the issue of how to distribute use opportunities within the private sector. Past management decisions concerning these questions have been subject to a substantial number of threatened and actual lawsuits, civil disobedience, and Congressional inquiry (Utter and McCool 1978).

The use allocation issue on whitewater rivers is comprised of two subissues that we have termed **allotment** and **rationing**. Following a decision to handle the commercial and private sectors separately, a management agency must determine how much use to apportion or **allot** to each sector. Next, distribution of individual use opportunities, or **rationing**, occurs. The agency rations use opportunities in the private sector by employing some form of nonmarket mechanism such as first-come first-served, or a permit lottery (Stankey and Baden 1977). Individual use opportunities within the commercial sector, however, usually are not rationed by the agency; rather, outfitters ration commercial use through a type of pricing system (over which agencies exercise varying degrees of control) in which they sell river trips to people willing and able to pay for them.

The purpose of this paper is to examine selected results from a study of use allocation on the Middle Fork of the Salmon River in Idaho. Two main topics are discussed. The first deals with the preferences of actual and potential river users for various allotment and rationing techniques. The second deals with potential adverse effects that allocation techniques may have on the important float-trip-user desire to get away from the pressures and involvements of everyday life.

STUDY DESCRIPTION

The Middle Fork of the Salmon River, a component of the National Wild and Scenic Rivers System, was selected as the setting for this study because (1) its recreation use characteristics are typical of those found on other whitewater rivers around the Nation, and (2) the river has an established lottery allocation program that has been in effect since the early 1970's.

During the 1978 river floating season, data were collected by means of a self-administered questionnaire distributed to commercial and private users randomly sampled immediately following their river float trip and to a systematic random sample of rejectees (individuals who had submitted an application for a private trip permit and were subsequently "rejected" in the lottery). The questionnaire contained the following five components: (1) user preferences for allocation techniques, (2) experience expectations, (3) general float trip characteristics, (4) previous experience of users, and (5) user demographics. A total of 1,451 individuals were sent questionnaires; 1,166 were returned for an overall response rate of 80 percent. In the allocation portion

of the questionnaire, respondents were asked to rate the following seven allotment techniques and six rationing techniques on a five-point Likert-type scale.

Allotment Techniques

1. *Test river.*—One river could be selected as a "test" river with no limit on the number of parties that could float it. Then, the percentages of use that naturally occur on this test river (for example, 60 percent commercial use and 40 percent private use) could be applied to whitewater rivers such as the Middle Fork.
2. *Historical use.*—Historical use levels could be employed. For example, assume that the USDA Forest Service first set a limit on Middle Fork use in 1978. If it turned out that records of past use showed that private parties made up 60 percent of the use and commercial parties made up 40 percent, these would be the percentages applied to 1978 and the future.
3. *Even split.*—Regardless of how use percentages developed in the past, a management agency could divide use by making a 50-50 split to the private and commercial users.
4. *Even-pool.*—A variation of the 50-50 split might be used. If either the commercial or private sector did not have enough demand to fill its 50 percent of the use limit, the leftover amount of use would be available for the other sector to use. However, the following year the system would begin all over with the 50-50 split.
5. *Percentage of disappointment.*—Equal percentages of people from each sector could be allowed to go down the river. For example, assume that for one particular year demand for private trips on the Middle Fork was 1,000 people and for commercial trips was 3,000 people. If the total use limit was only 3,000 people, then:

75 percent of 1,000 private users could go =	750
75 percent of 3,000 commercial users could go =	2,250
The total equals the use limit, or	3,000.

6. *Treat everyone the same.*—Commercial and private users could all be handled in the same manner, i.e., **all** potential users would first have to obtain a permit from the managing agency. Then, those who are successful would contact a commercial outfitter or organize a private trip.
7. *Middle Fork system.*—Use the system presently employed by the USDA Forest Service on the Middle Fork. (Respondents were informed that for the 1978 season the commercial sector was alloted 46 percent of the use limit and the private sector was alloted 54 percent).

Rationing Techniques

1. *Lottery.*—Use a lottery (i.e., "draw the applicants' names from a hat").
2. *Knowledge and skill requirements.*—Give priority for permits to those who meet wilderness knowledge and skill requirements.
3. *Advance reservation.*—Use advance reservations by mail, phone, etc., with early requests favored over later ones.
4. *Priority for first time users.*—Give priority for permits to those who have not floated the river before.
5. *Lottery-reservation.*—Use a combination system such as distributing half the private permits by a lottery and the other half by advance reservation (phone or mail, etc.).
6. *Priority for Idahoans.*—Give Middle Fork permit priority to Idahoans.

The response categories ranged from **very poor** (+1) to **very good** (+5). The allotment and rationing techniques were developed from a special workshop on river recreation use allocation.

A six-item scale termed Stress Release/Escape (SR/E) adapted from Driver (1977) was employed to measure the individual's expectation that the float trip would provide an outlet for release and escape from the pressures of everyday life. The scale items were randomly distributed with items from five additional scales to (1) provide data on additional float trip expectations with which to assess the relative importance of SR/E, and (2) conceal the principal motive behind the SR/E scale. A five-point Likert format was also used for the expectation scales. Response categories ranged from **not at all important** (+1) to **extremely important** (+5).

RESULTS

Allocation Preferences

Allotment techniques

The technique most preferred by commercial river floaters was the current Middle Fork System, and the technique most preferred by private river floaters and rejectees was Even-pool (table 1). The differences between the most preferred technique and the second most preferred technique were small for all groups. All groups rated Test river as the least preferred technique.

The overall order in which river floaters and rejectees ranked techniques was similar. Each group tended to favor those techniques that, apparently, would provide them with better chances for river floating opportunities or with which they were familiar. It is also noteworthy that only two or three techniques were rated poorly by a majority in each group. This suggests that managers have considerable flexibility in selecting an acceptable allotment technique.

In light of the favored status of Even-pool and the Middle Fork System, it should be noted that there are two fundamental similarities between these allotment methods. First, the initial 50-50 allotment of Even-pool is comparable to the near 50-50 allotment of the Middle Fork System. Second, the redistribution under Even-pool of surplus portions of one sector's allotment (to handle excess demand in the other sector) is similar to a provision of the Middle Fork System that allows some transfer of unused float trip opportunities between sectors.

Rationing techniques

All groups were asked to rate rationing techniques although such techniques are usually limited to the private sector. Commercial river floaters were included because it is conceivable that they may take a private float trip in the future and because the rationing technique employed may influence the availability of commercial floating opportunities.

Commercial users rate Advance Reservation the highest and Knowledge and Skill Requirements second (table 2). Private users and rejectees (i.e., those respondents directly affected by private permit rationing) also rate Knowledge and Skill Requirements second, but their most preferred choice is Lottery. Least acceptable to all respondents is Priority for Idahoans. Both a majority of commercial and private groups found that the same four rationing techniques were acceptable— Advance reservation, Lottery, Knowledge and Skill Requirements, and Lottery-Reservation. Rejectees, however, found only the Lottery and Knowledge and Skill Requirements techniques acceptable. It is interesting to note that the rejectees apparently are not disenchanted with Lottery as a rationing technique. In sum, then, the preferred techniques of all groups are consistent with the systems under which each operated in 1978, i.e., the outfitters' advance reservation (and pricing) system for the commercial users and the USDA Forest Service's lottery for the private users and rejectees.

Table 1.—*Respondents giving acceptable ratings to allotment techniques*[1]
(In percent)

Allotment technique	User type			χ^2
	Commercial	Private	Rejectee	(significance)
Test river	25	18	15	$p = 0.0005$
Historical use	65	48	42	$p < 0.0001$
Even split	53	49	52	$p = 0.0560$
Even-pool	87	78	76	$p = 0.0160$
Percentage of disappointment	78	52	47	$p < 0.0001$
Treat everyone the same	30	57	55	$p < 0.0001$
Middle Fork system	92	77	64	$p < 0.0001$

[1]An evaluation of **okay, good,** or **very good** constituted an acceptable rating for an allotment technique.

Table 2.—*Respondents giving acceptable ratings to rationing techniques*[1]
(In percent)

Rationing technique	User type			X^2
	Commercial	Private	Rejectee	(significance)
Lottery	57	80	92	$p<0.0001$
Knowledge and skill	66	56	51	$p=0.0005$
Advance reservation	84	54	32	$p<0.0001$
Priority for first time users	43	36	43	$p=0.0180$
Lottery-reservation	52	53	38	$p=0.0130$
Priority for Idahoans	21	23	17	$p<0.0001$

[1]An evaluation of **okay, good,** or **very good** constituted an acceptable rating for a rationing technique.

Allocation Preferences and User Expectations for Stress Release/Escape

A primary function of river management is to provide satisfactory recreational experiences consistent within overall policy constraints. Driver and Brown (1975) indicate that it is important to identify the social psychological outcomes visitors anticipate from their experience. These expected outcomes can then be used to estimate the impact management actions may have on recreational experiences. Driver (1977) has developed a number of scales that tap many of the expectations held by recreationists. These include solitude, action/excitement, achievement, status, affiliation, learning/discovery, and stress release/escape.

Because allocation techniques of the type discussed in this paper are direct regulatory actions, a number of analysts of the allocation issue are concerned as to whether or not such techniques will impinge on recreationists' desires for "getting away from it all". To address this issue, commercial and private users were asked to respond to a six-item scale measuring this dimension of their anticipated experience. Rejectees were not included in this portion of the study because we were only interested in individuals who had expectations of a specific floating experience.

Factor analysis was used to determine if the scale items used to measure the Stress Release/Escape (SR/E) expectation did so in a manner consistent with the findings of previous studies employing similar techniques. The extracted factor of SR/E contained five of the six original scale items plus one item initially associated with a solitude expectation scale. The items in the SR/E scale possessed a reliability coefficient of $\alpha = 0.83$. Of the five expectations measured, SR/E was the second highest in importance.

We assumed that river floaters for whom SR/E was important would view restrictive use mechanisms more negatively than floaters for whom SR/E was unimportant. In other words, the group scoring higher on SR/E would be more sensitive to regulatory actions and, therefore, would tend to give lower ratings to allocation techniques.

Examining the differences for the 13 allocation techniques revealed that there were 10 (or approximately 77 percent) for which private users gave lower ratings than commercial users. According to the above reasoning, it was hypothesized that private users would score higher on the SR/E expectation than the commercial users. However, results of the t-test employed to test this hypothesis, shows that it is not supported. The groups' scores differ in the opposite manner of that hypothesized—the commercial users scored higher on SR/E. Such an outcome suggests that the differences in commercial and private users' SR/E expectations do not explain their differences in allocation ratings. Rather, some other factors that distinguish the commercial and private users are responsible for the differences between ratings.

Although the two groups showed little difference in their desire to use the float trip as an escape from everyday life, it is possible that within each group a negative association exists between the strength of this desire and the individual's rating of allocation techniques. It is also possible that some techniques may show a higher negative association than others

because some techniques may be perceived as more regulatory than others. For example, respondents may feel that rationing use by Knowledge and Skill Requirements, with associated testing, licensing, and enforcement procedures, may be inherently more regulatory than Lottery. If so, we would expect to find a higher negative association between SR/E and the former technique than between the latter. Pearson correlation coefficients were calculated to test this hypothesis.

Only one correlation coefficient demonstrated any significance— the correlation of SR/E scores of the commercial users with their ratings for the Percentage of Disappointment (PD) allotment technique (table 3). Even this weak correlation is positive rather than the hypothesized negative. Consequently, no practical relation exists between SR/E experience expectations and allocation ratings of commercial and private users.

There are several possible explanations for the lack of a relation between the individual's desire to escape from the everyday world and preferences for use allocation techniques. It is possible that the scale is not valid. However, the extensive use of the scale in many different situations makes this explanation questionable. Or, floaters may feel that allocation techniques are necessary to provide a setting in which they can escape from it all. It is also possible that individuals who hold high expectations for SR/E and who are sensitive to use allocation techniques no longer float the Middle Fork because of their perception of the amount of regulation. The great variation in SR/E scores found and the high status usually placed on a Middle Fork float trip, however, would seem to discount this explanation.

Finally, it may be that floaters discriminate among different segments of the river trip experience and the impact of management on each. Using a system similar to the one proposed by Clawson and Knetsch (1966), the trip may be broken into three segments. The initial or pretrip segment involves such things as planning, preparation, and travel to the river. The on-site segment in which the river running activity occurs and in which expectations are realized is next. The post trip segment is third and includes travel from the river, reinvolvement in everyday life, and reflection on the entire experience. User recognition of these segments to their overall float trip experience is suggested by the SR/E and allocation preference data.

Middle Fork users appear to associate allocation techniques with only the pretrip portion of their experience and to relate SR/E with only the on-site portion. This makes sense, because the allocation techniques discussed in this paper have their direct effect on such pretrip involvements as planning and preparation. Once an individual makes it into the system, the expectations for escape may be reinforced and strengthened. Satisfactions of such expectations would be influenced principally by on-site management.

SUMMARY

The commercial users, private users, and rejectees had distinct preferences among the 13 allocation techniques presented to them. Overall, the most preferred allotment technique for all three groups was Even-pool. The Middle Fork System was also highly favored by all groups. The most acceptable rationing technique for the commercial users was Advance Reservation; Knowledge and Skill Requirements was rated second. Although private users and rejectees also gave this latter technique a second-place ranking, the most acceptable rationing technique for them was Lottery.

Table 3.— *Pearson correlation coefficients between commercial and private users's scores for stress release/escape and their ratings for allocation techniques*

Subpopulation	Allotment technique[1] ratings							Rationing technique[2] ratings					
SR/E scores	TR	HU	ES	EP	PD	ETS	MFS	L	KS	AR	PFU	LR	PI
Commercial users	0.01	–0.02	–0.02	0.05	0.11[3]	0.04	–0.05	–0.02	0.02	0.05	0.01	0.03	–0.05
Private users	–0.05	–0.00	0.03	–0.01	–0.07	0.05	–0.01	0.07	0.05	0.05	–0.01	–0.00	–0.06

[1]TR = Test River, HU = Historical Use, ES = Even Split, EP = Even-pool, PD = Percentage of Disappointment, ETS = Everyone the Same, MFS = Middle Fork System.

[2]L = Lottery, KS = Knowledge and Skill Requirements, AR = Advance Reservation, PFU = Priority for First Time Users, LR = Lottery-reservation, PI = Priority for Idahoans.

[3]Significant at the 5 percent level.

The data suggest that concern for possible negative consequences of direct allocation techniques on river floaters' SR/E experiences may be unfounded. No relation appears to exist between Middle Fork floater SR/E expectation scores and their preferences for allocation techniques. It is assumed that other factors explain the underlying reasons for floaters' allocation preferences. This conclusion is similar to the findings of Schreyer and Nielson (1978). These researchers compared floaters scoring high on a stress release/solitude scale against those scoring low according to the users' ratings of four different allocation techniques. For three of the techniques, no significant rating differences were found. In the case of the one technique for which a difference was identified, the difference was small.

However, Schreyer and Nielson (1978) did find significant correlations between stress release/solitude expectations and on-site management activities. These data support our hypothesis that river floaters may psychologically segment the experience and be sensitive to the impact of different techniques on each segment. Certainly, further research to explore this hypothesis would be useful.

The data suggest several characteristics of allocation techniques that may be preferred by floaters in other similar whitewater settings. Acceptability of a technique may be influenced by the familiarity floaters have with the technique and by its inherent sense of fairness. The extent to which the technique does not impinge upon the pretrip planning segment of the experience may also be influential. Finally, users may prefer those techniques that would tend to enhance or at least maintain their chances for future participation in a float trip.

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DISPLACEMENT OF USERS WITHIN A RIVER SYSTEM: SOCIAL AND ENVIRONMENTAL TRADE-OFFS

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BACKGROUND

The nature of the recreation relation between people and resources is extremely varied and dynamic. How these relations affect the quality of natural areas and enjoyment of area users has been the focus of outdoor recreation research since the early 1960's. During the 1960's, it became apparent that it was no longer sufficient to think in terms of facilities alone when considering quality in outdoor settings—the quality of the recreational experience had to be considered as well (Lucas 1964). The extent of national concern over the consequences of increasing use of our Nation's natural, scenic, and recreational resources was highlighted in 1968 by the passage of the National Wild and Scenic Rivers Act (P.L. 90-542):

> It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values, shall be preserved in free-flowing condition and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.

However, the enactment of this legislation has not, thus far, succeeded in protecting our river systems from damages due to overuse. On the contrary, it is argued that national designation may have accelerated the degradation of the characteristics that the Act was designed to preserve because we have focused on protection from development and not from recreational use.

Faced with increasing use levels, managers have sought to determine and prevent the resulting impacts by conducting site-specific studies and implementing site-specific remedies. This piecemeal approach has been inefficient and has led to erroneous conclusions regarding the use of these resources, resulting in inappropriate management decisions. At present, however, the managers of our natural resources have few alternatives. They are required to pursue the potentially conflicting goals of preserving their natural area and promoting its use. This dilemma is particularly disrupting to riverways, due to interconnectedness of river systems, the wide variety of potential uses, and the multiplicity of jurisdictions normally present along river corridors.

Because it is difficult and often undesirable for any one recreational area to provide the full range of recreational experiences, a limited set of management objectives are suggested that enhance specific opportunities appropriate to the resource base. Choosing such management objectives, however, is a legal and political nightmare.

To provide a foundation for resource management decisions, researchers and managers have invested substantial effort in relating resource quality to area utilization. Recognizing the complexity of recreation use on natural areas, researchers and agencies have offered a series of conceptual and methodological frameworks for addressing the problem. Because the issue concerns escalating demand for a finite resource base, models that associate demand for recreation with the capacity and limitation of the resource have become increasingly popular. Although assuming a wide variety of approaches, these studies have become generically known as recreational carrying capacity.

Recreational Carrying Capacity

Recreational carrying capacity has been defined as the level at which an area, having a characteristic use, can be supported (with the possible inclusion of development) over a specified time without causing excessive damage to either the physical environment or the experience of the user (Lime and Stankey 1971). Early carrying capacity work followed econometric lines (Cicchetti and Smith 1973, Fisher and Krutilla 1972), which hypothesized a negative association between individual satisfaction and the number of user contacts in a wilderness area. The popularity and use of the econometric model is understandable given the roots of the carrying capacity concept. Carrying capacity developed as a range management concept that involved a negative consequence to a population as a result of overuse of a feeding range (Heady 1975). Obviously, the impacts of recreational "overuse" do not have similar overt impacts on the user. In this search for recreational use consequences, the focus centered on the principal product of recreation—user satisfaction.

Satisfaction as a Variable

Two related concepts are used to understand satisfaction—expectancy and discrepancy. As described by Schreyer and Roggenbuck (1978) expectancy is the "...belief that a particular act will be followed by a particular outcome...Recreation may be considered an activity in which individuals engage with the expectation of certain rewards such as excitement, [and] solitude...." Discrepancy is the difference between the expected and the actual outcomes. Dissatisfaction results from expectations that are not realized. Conversely, fulfilled expectations ensure satisfaction.

The use of satisfaction as a consequence variable in outdoor recreation is grounded both in leisure theory and common sense. However, when used to explain specific attributes of specific user groups at specific sites, findings have not supported the econometric hypothesis. Indeed, numerous researchers have reported no significant relation between area density and user satisfaction. Shelby and Nielsen (1975) reported user stated satisfaction uniformly high on the Colorado River regardless of the user density on that river. Similar results have been reported by Heberlein and Vaske (1977) on Wisconsin's Bois Brule River, and Blackwood (1977) on Wisconsin's Wolf River. However, because the above studies utilized similar methodologies and were specific to a single resource, a question exists regarding interpretation of findings. Specifically, if no relation exists between area use density and stated user satisfaction, then application of the econometric model suffers from the exclusion of one component, that is, user adaptation to increasing contact levels. However, if as Schreyer (1979) pointed out: increasing use alters the definition of the experience (thereby displacing those no longer desiring the new experience, with new users accepting the encountered situation) then the inverse relation between area density and user satisfaction would be correct when viewed beyond a specific site at a specific time, with user displacement as the negative consequence.

Concept of Displacement

Displacement is a move away from an unacceptable situation rather than a move toward an optimal one. This distinction is useful in separating displacement, a form of reactive movement, from other forms of movement behavior. Among the other forms of movement behavior are: (1) Active migrations. Users methodically seek a suitable destination according to their values. Groups typifying this form of behavior can be illustrated by white-water canoeists who seek a variety of skill-test, risk-seeking outlets. Within this group, the movement is a part of the experience, i.e., "doing" a specific set of rivers. (2) Passive migration. Users elect a location as a result of constraints external to their individual expectations or preferences. Visiting areas to meet friends for picnics, choosing locations because other members of the participation group desire those locations would fall into this classification. (3) Diurnal requirements of an activity. Users relocating within sites to accommodate requirements of an activity. Fishermen moving to different locations on a lake at various times represent such movement. The motivation of the movement is dictated by the requirements of the activity. The movement of the fish rather than movement as a reaction to negative characteristics of the site dictates user location.

Movement behavior is then a general rubric, while displacement is a specific component characterizing negative reactive movements. Adjustments of use both in time and space are involved. Figure 1 represents this relation, as use increases users' expectation curve shifts. In other words, the type of person for whom the curve is based keeps changing, a process

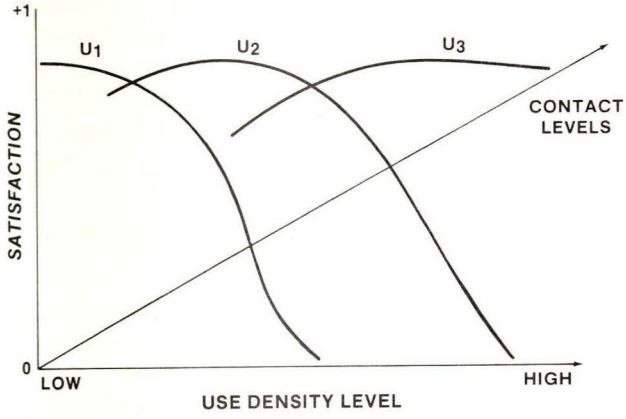

Figure 1.—*Conceptual relation between satisfaction and area density with displacement*
where: U_1 = *low density oriented users.*
U_2 = *users preferring some social contacts.*
U_3 = *high density tolerant users*
(these user group curves represent an array of curves along a user density tolerant continuum)
As area use density and subsequent user contacts increase, the specific site begins to attract users tolerant of the escalating human use. They replace previous site users in a successional fashion.

that may never end if based solely on social criteria. Thus, managers cannot find the carrying capacity by measuring satisfaction. They will be continually measuring satisfaction of a different user, i.e., one who enjoys the current situation.

Again, a number of river studies (on the Wolf, Colorado, Brule, Namekagon, etc.) have shown that at any given point in time, on any river, the majority of the users will say they are satisfied with their experience. That is, in a one-time, site-specific experience study, the dominant response will be yes, we are satisfied. Simply by being at that river, the majority are accepting the situation at that site at that time.

It is to be expected that those who are dissatisfied with their experience will eventually do something about it—change the day or time of day of a visit, change the location on the river of the visit, change rivers, or change activities entirely. So the question is not "who is satisfied now with their experience on a river", but "are those who are satisfied now the same group that was satisfied 5 years ago on this site—and, if not, where have these people come from and where have the others gone?" To answer such questions one-river studies must be tied into the context of other similar rivers in the same region and thus into the concept of movement behavior, or displacement. These questions may also be addressed by a longitudinal examination of specific users.

So the basic observation behind displacement is that people leave. New users come in, change a site by the nature of their behavior and activities, and affect the experience of the other users. One of the driving forces that sets this succession of users in motion appears to be perceived density (Becker, 1978a). On a site where use is increasing, those new users who stay tend to be tolerant of encountering other people, whereas those who leave tend to be intolerant of encountering other people and change their visits to the river in time or location, change rivers, or drop out altogether. As will be discussed, the combination of the Lower St.Croix/Upper Mississippi studies was able to pick up just such movement.

STUDY METHODOLOGY AND LOCATION

The purpose of this study was to examine users from both the Upper Mississippi and Lower St. Croix Rivers for evidence of displacement. Specifically, the study objectives were:

(1) determine the extent user densities affect choice of river location and time of visit for various user groups;
(2) determine criteria individuals use for evaluating preference for specific rivers; and
(3) determine the extent satisfaction, as a variable, is usable for area managers.

During summer and fall of 1977 and winter of 1978 user studies were conducted on the Lower St. Croix Wild and Scenic River (Becker *et al.* 1979) and the upper reach of the Upper Mississippi River (Pools 1 to 10) (Becker 1978b). Approximately 3,400 questionnaires were distributed to transient on-site users of both rivers and to Lower St. Croix riparian landowners.

Questionnaires to transient users were distributed on two separate schedule forms. The two forms represented various question areas. The forms were distributed using the same sampling scheme and served as a replicated measure for reliability checks. Questions that were identical on both forms were collapsed for aggregate sample presentations for each

river. The surveys for each river user group examined user attitudes and perceptions and were related to riverway use. Additional questions designed to examine use pattern variation, use levels and user satisfaction, and user expectation were included.

On the Lower St. Croix River, interviews were conducted at both random and selected sites between Memorial Day and Labor Day. On the Upper Mississippi, interviews were conducted at islands, sandbars, and beaches between St. Paul, Minnesota, and Guttenburg, Iowa, from June 21 through October 10. For this paper users interviewed after Labor Day were excluded from the analysis. Sampling was conducted on a constructed season technique—questionnaires were distributed at each site during various times of the day and days of the week in proportion to the summer season.

The Lower St. Croix

The Lower St. Croix has been a part of the National Riverways System since 1972. The St. Croix is the only national riverway protected from its origin to its confluence. It is administered by the National Park Service and the Departments of Natural Resources of Minnesota and Wisconsin.

The Upper Mississippi

From the beginning of use of the Mississippi River, it has been considered in two sections: the Upper Mississippi and the Lower Mississippi, with the point of demarcation Cairo, Illinois, where the Ohio River enters. Both the Upper and Lower sections have stretches where, by characteristics, and/or use, one is distinct from the other resulting in further subdivisions. The concern of this particular study is that part of the Upper Mississippi from the Twin Cities in Minnesota to Guttenburg, Iowa.

RESULTS

Displacement Between the Lower St. Croix and Upper Mississippi

Analysis involved comparisons of users on different resource bases. This comparison is essential if users of a resource have shifted or left one area for another to achieve a favorable social experience.

If the hypothesis regarding displacement is correct, users would shift to areas that afforded a satisfying experience. Thus, when taken as separate settings, users of both the Lower St. Croix and Upper Mississippi should reveal uniformly high levels of satisfaction regardless of area density or use. This is indeed what we found—both Lower St. Croix and Upper Mississippi River users reported similar high levels of satisfaction (table 1.)

Table 1.—*Stated satisfaction of river users: responses to the question, "How would you rate your visit to the river today?"*

Response	Upper Mississippi		Lower St. Croix	
	No.	*Percent*	*No.*	*Percent*
Poor	9	1	9	1
Fair	64	4	139	7
Good, but I wish a number of things had been different	202	12	171	10
Very good, but could have been better	274	17	276	16
Excellent, only minor problems	626	38	614	36
Perfect	467	28	513	30

$t = -0.83$

Further analysis of users on both the Lower St. Croix and Upper Mississippi River centered on those individuals who had experiences on both rivers but had expressed a preference for one. These persons were extracted from individuals responding to the regional follow-up questionnaire. Individuals were asked to identify if they preferred either the Lower St. Croix or the Upper Mississippi. Those selecting either river were then directed to one of two qualifying questions.—"If you used to visit the Lower St. Croix, why do you no longer visit there?" or "If you used to visit the Upper Mississippi from St. Paul to Guttenburg, Iowa, why do you no longer visit there?" Users familiar with both rivers both preferring the Upper Mississippi identified the following elements as reasons for no longer visiting the Lower St. Croix River: too crowded, too few public beach areas, unsafe boat operation, and too few public facilities. Users familiar with both rivers both preferring the Lower St. Croix identified the following elements as reasons for no longer visiting the Upper Mississippi: water polluted, unsafe swimming, litter and debris, and barge traffic.

CONCLUSIONS

Users on both the Upper Mississippi and the Lower St. Croix Rivers were equally satisfied with their experience. During summer of 1977 the Lower St. Croix had approximately 800,000 visitor days over its 52 miles. During this same period the 300 + miles of the Upper Mississippi had approximately 300,000 user days. If viewed as individual (unrelated) rivers, findings would appear to sustain the idea of no relation between area density and user satisfaction. However, when viewed as a system, findings sustain the idea of user movement to achieve a desired social experience or environmental setting.

This paper suggests several types of displacement occur on the Lower St. Croix and upper reaches of the Upper Mississippi Rivers. Users and riparian landowners are purposefully avoiding areas and periods of the day and days of the week with high use levels.

Given a course of events that allows use levels to increase and subsequently managing for these higher levels will result in only density-tolerant activities and people remaining. Some persons will either be excluded from participating or be forced to shift their expectations and activities. Knowledge of this process demands recreation managers decide who they want to create what type of experiences for, and then implement measures to ensure its occurrence. If we, as a society, care to offer a full continuum of recreational experiences, we must take a broad perspective—temporally and spatially—and administer recreational areas for different types of experiences and activities.

The Lower St. Croix with its status as a nationally significant river should be managed to enhance and preserve those experiences that made it desirable for designation. Preservation cannot stop with management of the resource base in isolation to the human experiences the area provides. It is of course feasible to allow use on the Lower St. Croix River to continue to grow and in the course of such growth provide satisfying experiences for large numbers of individuals. But the inclusion of larger numbers of users will iteratively remove individuals sensitive to increasing densities and continue to alter the social qualities now present on the river. User movement from the Lower St. Croix River to the Upper Mississippi River will continue in the absence of a unified regional management plan. The politically popular management theme "preado optimum," the greatest good, must incorporate definitions of good beyond strikingly large numbers.

Thus, every site cannot be everything to everybody. A wild and scenic river should be the setting for an array of experiences that differ markedly from a developed multiple use river. Similarly, an area designated to promote social interactions and accommodate large numbers of people in an outdoor setting should not be managed to accommodate individuals seeking a low density, solitude-oriented experience. To attempt such mergers on a single area will result in a loss of both social and natural diversity.

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VISITOR IMAGES OF NATIONAL PARKS: THE INFLUENCE OF SOCIAL DEFINITIONS OF PLACES ON PERCEPTIONS AND BEHAVIOR

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Recreation participation often depends upon a specific setting, which may represent a key aspect of the recreation experience. While some environments may appear generalized in the mind of the user (e.g., a local park), others may be strongly imbued with meaning and seen to possess highly specialized characteristics (e.g., Bryce Canyon National Park). As images held by participants may affect their behaviors (Lee 1972), their satisfaction (Schreyer *et al.* 1976), and their potential to conflict with others (Jacob 1978), it is valuable to understand the nature of such images.

Personal definitions of recreation places are the result of either direct experience (Tuan 1978), indicating the functional role of the environment in fulfilling expectations (i.e., the capacity to meet one's needs), or of socio-cultural value messages (Berger and Luckman 1966)—for example, National Parks are a part of our "cultural heritage." It is likely that an image will consist of a dynamic interaction process between these two dimensions (Neisser 1976).

A major issue concerns how the differing nature of images held of a given environment affects behavior in that environment. Such differences may be useful in understanding the environment-behavior link, and could conceivably be linked to environmental management. Stankey (1972) has suggested that users of wilderness areas may be identified by their degree of "wildernism"—that is, by the degree to which their attitudes and beliefs concerning wilderness match the specific purpose and intentions of wilderness legislation. In this sense, "image" was defined by a particular set of characteristics—those described in the Wilderness Act. Although this is not the full range of dimensions by which people define wilderness, it gives a means of linking image to administrative concerns. Thus, Stankey proposed that management should follow the preferences of those whose environmental images most closely matched the definitions created in the Wilderness Act. Stankey has provided data indicating that users could be distinguished by their degree of "wildernism," and that these differences were linked to differing behaviors, backgrounds, and preferences for management situations (Stankey 1971).

The purpose of the present study was to explore the extent to which such an image exists for National Parks. That is, does a dimension of "parkism" exist that may be defined through extractions of legislative intent? Can such a dimension distinguish among different types of users or their backgrounds? Are such differences linked to various expectations for recreation experiences? Finally, can such a dimension differentiate among users' preferences for strategies of management? To explore these relations, a study was carried out in a Park Service area that was also considered a wilderness. Comparative analyses were therefore made concerning users' degree of "wildernism" and "parkism" to explore links to background, behaviors, perceptions, and attitudes. Users studied were involved in taking float trips on the Green and Yampa Rivers in Dinosaur National Monument.

METHOD

The Study

During the summer of 1975, a questionnaire was distributed to river recreationists as they disembarked from their trips. The questionnaire was to be completed upon returning home and mailed back in a postage-paid envelope. It asked respondents' attitudes concerning management strategies for the monument, perceptions and evaluations of encounters with others, a scale measuring experience expectations, and background and trip-related variables. A systematic random sample was stratified by day vs. overnight user. Three 4-day sampling clusters were employed for each of the four major use months of May, June, July, and August. A total of 1,141 questionnaires were distributed. Two follow-ups yielded 854 usable returns, representing a 76 percent response rate.

Wildernism

A Likert-type scale of 27 items concerned the purposes and appropriate uses of wilderness. A final scale of 17 items was ultimately developed using the following criteria: items that could separate users were sought in order to make a more refined measure. If a question was so general that everyone could agree with it, its utility as a measure of differing conceptions of wilderness would be of little value even though it related to a real aspect of wilderness. Average scores were computed for each individual, ranging from 1 to 5, with the latter indicating strong agreement with the legislative conception of wilderness.

Parkism

The development of a scale to measure a National Park construct proved to be far more difficult. Park Service mandates are often couched in broad generalities, in terms of the uses and experiences felt to be appropriate. Even though an experience is being defined, it is certainly much more diverse and vague than the wilderness concept. "For the benefit and enjoyment of the people" leaves considerable leeway for interpretation. A search was made of the literature to find common themes. Conceptions of the values and appropriate uses of national parks and monuments have tended to evolve over time. Further, values tend to be placed in the broadest possible phrases, making it difficult to find statements that people would vary on.

Fifty-three items were pretested, resulting in the selection of 27 for the questionnaire. As with wildernism, 17 items were ultimately used for the actual index, based on the separation of user evaluations. Seventeen items were used so that both indices would be of equal size, though this was not really necessary for scale validity. Wildernism scales were shown to be valid, but the concept of parkism was much more tentative. Because the scales were intended for application with other management-related questions in the study, the greater strength of the wildernism scale was used as a rationale for giving it a wider exposure. The wilderness scale appeared in questionnaires distributed from May through July, while the parkism scale appeared in questionnaires distributed in August. Such a method may be subject to potential bias through differences in users across time. The smaller number of users rating the parkism scale could also reduce the reliability of the results analyzed with this scale. A total of 657 respondents received wildernism scores, and 200 respondents received parkism scores.

RESULTS

User Identification

Both scales distributed users along the range of average scores. The range for mean wildernism scores was from 1.0 to 5.0, with five individuals obtaining the maximum score. The median score was 3.4, indicating a shift toward the high end of the spectrum. Scores were divided into three classes of High, Medium, and Low Wilderness purism scores, with the middle group containing 50 percent of the sample and each extreme representing 25 percent. For the sake of convenience, the High, Medium, and Low Wilderness groups will subsequently be referred to as HW, MW, and LW, respectively. The range in values for the categories were 1.0 to 3.0 for the LW, 3.01 to 3.85 for the MW, and 3.86 to 5.00 for HW.

The range of responses for the park purism score ran from 1.0 to 4.73, slightly less than the range for the wilderness scale. The median score of 3.84 shows a much stronger shift toward the "park purism" end of the scale. Again the three categories of High Park Purism (HP), Medium Park Purism (MP), and Low Park Purism (LP) were created. The range for the LP was 1.0 to 3.50, accounting for 25 percent of persons scoring on the scale; 3.51 to 4.10 for the MP, accounting for 51 percent; and 4.11 to 4.73 for the HP, including 24 percent.

No relation was found between wildernism score and age or income level. However, a significant positive relation existed between the score and amount of education. This finding is consistent with findings of high education levels among wilderness users (Hendee *et al.* 1968). Persons taking different types of trips also differed in wilderness scores (table 1). Persons on private float trips—ran the trip themselves using their own equipment—tended to be more highly represented in the HW class, and those on commercial trips—guided down the river by a professional outfitter—tended to be more highly represented in the LW category. Persons on "educational" trips—those sponsored by educational institutions —tended to have intermediate scores.

Results of analyses broken down by the three park categories showed that few significant differences exist to characterize the groups. The only background variable showing a significant difference was, like wildernism, education. However, the highest category was not HP, but rather MP. This tendency for the MP category to register the most extreme response was noticed in other situations as well. The difference could be purely a chance distribution; alternatively, more highly educated individuals might be more likely to take moderate positions on the generalized value questions that form much of the scale. In most cases the differences between the HP and MP were small; the largest differences were seen between these two and the LP group. There is no way to distinguish the different categories of parkism by the kind of trip (commercial, private) individuals in the various groups selected.

The Nature of the Experience

Seven scales measuring respondent expectations for the particular recreation experience were developed following the methods created by Driver (1977). An examination of the experience expectations of the three wilderness groups shows some distinctive differences (fig. 1). A comparison of HW and LW categories shows some divergences in directions that might have been expected. The action-excitement expectation is high for everyone, but not as high for HW's as for LW's and MW's. The person who has strong wilderness values tends to equate the nature and excitement components, while those at the lower end of the scale place more importance on excitement.

Solitude is an important wilderness value, and the data show some trends that suggest support for this value. For affiliation, the HW's scored lowest and the LW's highest. Further, HW's felt stress/solitude to be a more important motive than LW's.

The status scale shows some of the strongest differences—HW's gave it a far lower rating than MW's or LW's. This may suggest that attunement to wilderness values are more likely to be seen as ends in themselves, and side benefits such as prestige may be less important. Two scales, autonomy/achievement and self-awareness, did not show differences among the categories. These values were less important to persons on float trips in general, and therefore may not be tied up with values related to participation.

For the National Park scale, two of the experience expectations showed significant differences among the groups. The first is experiencing nature. The[1] MP and HP categories both registered higher than the LP score (4.04), with the MP (4.49) being virtually the same as the HP (4.47). This difference makes sense if one assumes that persons who support values consistent with National Parks will be more attuned to experiencing nature. The second experience expectation is autonomy/achievement. The MP had the highest score (2.83), LP was second (2.68), and HP was

[1]*Scores relate to average scores of the verbal response —1 = not at all important, 2 = slightly important, 3 = somewhat important, 4 = moderately important, 5 = very important and 6 = extremely important.*

Table 1.—*Trip type for persons in the three wilderness categories*

Trip type	Wilderness category						Total
	LW		MW		HW		
	No.	*Percent*	*No.*	*Percent*	*No.*	*Percent*	*No.*
Commercial	123	73	197	62	84	49	404
Educational	24	14	68	22	31	18	123
Private	22	13	50	16	58	33	130
Total	169	100	315	100	173	100	657

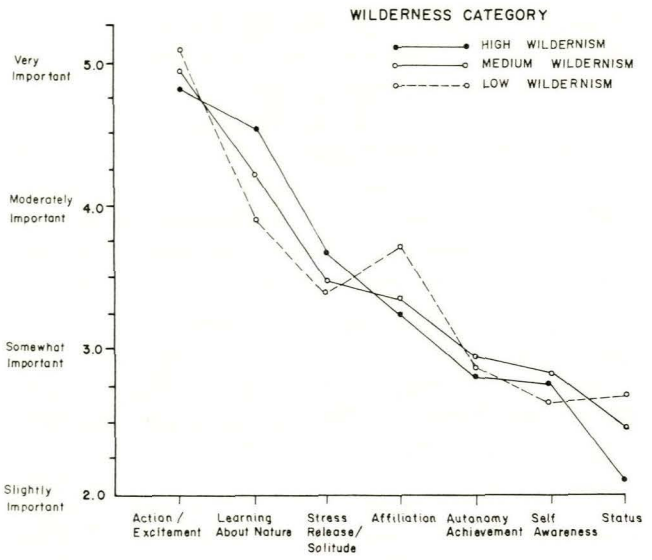

Figure 1.—*Profiles of experience expectations for the three wilderness categories.*

third (2.32). The low rating for the HP's may indicate a preference for "passive" (e.g., education) as opposed to "active" recreation.

Perceptions of Others

Users were also likely to perceive others differently depending on wildernism score. Those higher in the wildernism score were significantly more likely to feel they had seen too many people on the trip. Sensitivity was particularly high at campsites, where the Pearson correlation between numbers seen and the feeling of being crowded was $r = 0.68$ for HW and $r = 0.29$ for LW. Persons strong in wildernism were also more sensitive to the behavior of others. Three-fourths of the LW's found neither numbers nor behavior disturbing, but less than half of the HW's felt that way. Conversely, only 2 percent of the LW's and 2 percent of the MW's felt that numbers **and** behavior were disturbing, while 11 percent of the HW's felt this way. The HW's were twice as likely to consider numbers or behavior disturbing than the LW's.

The perception of crowding differed somewhat in the three parkism categories, though the limited numbers of persons in the sample make accurate interpretation difficult. The main trend was a greater sensitivity in the HP category to perception of crowding for total numbers of others encountered. However, this was not a consistent trend. The different types of people did not differ markedly in their perceptions of crowding at specific sites, nor were they more sensitive to behavior as opposed to numbers.

Preferences for Management

Perhaps the most crucial concern relating to wilderness and park orientation is whether or not the groups differ with respect to actions that managers might take to increase satisfactions or to protect the resource. Three major areas of management considered were campsite development, use distribution, and regulation.

The three wilderness groups all differed systematically with respect to their answers to questions on campsite development. HW's preferred less development and natural conditions. They did not desire to see more pit toilets and did not even want toilets cleaned more often. HW's were also strongly opposed to providing flush toilets. LW's were almost neutral on this issue. The one case in which the HW's were more in favor of an option was in the case of the suggestion to remove all toilets.

The three groups also differed in their responses to proposals for different kinds of facilities development (fig. 2). The LW and MW groups were moderately opposed to the provision of shelters for sleeping, but the HW group was almost solidly at the extreme end of the scale in opposition. The average response to the picnic tables question was to maintain the status quo. When the separate groups are examined, the HW's were somewhat opposed to removing tables and more

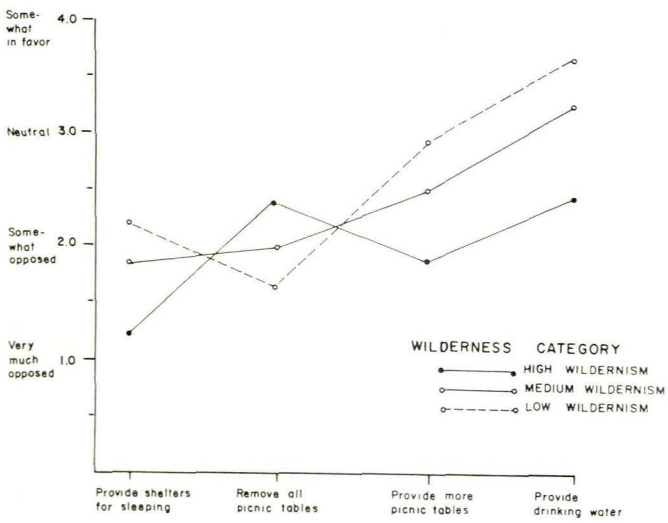

Figure 2.—*Average scores for wilderness categories for questions relating to facilities at campsites.*

strongly opposed to adding new tables. In contrast, the LW's were strongly opposed to removing the present tables but were neutral with respect to adding new tables. Providing drinking water has both strong convenience and development implications and could put values concerning nondevelopment to a strong test. As it turns out, the HW's opposed the proposal, MW's were neutral, and LW's were in favor of the proposal.

Many questions that dealt with controlling use to minimize the negative effects of crowding were not distinguished significantly by the groups. A possible reason is the lack of clarity in many users' minds concerning the possible implications of various strategies. The acceptance of any strategy depends on whether the control is more objectionable than encountering large numbers of people. About two-thirds of the LW's agreed that group size should be limited but 93 percent of the HW's felt it should be limited. Thirty-six percent of the HW's wished to see the maximum size set at less than 20 people, while 31 percent of the LW's wished to see the size set at less than 20. Twenty-eight percent of the HW's preferred a maximum group size of more than 30 people, while 36 percent of the MW's and 34 percent of the LW's felt that way. These differences are small and would probably have little or no influence on managerial decisions. All groups opposed zoning the rivers such that one would have high and one low use, though the HW's were the most strongly opposed.

The suggestion to establish more campgrounds was responded to neutrally by the HW's and MW's and somewhat favorably by the LW's. The neutral HW response is likely due to the mixed blessing of spreading out use (positive) by providing more facilities (negative). Assigning campsites was treated favorably by all groups. In this instance, the strongest positive response was recorded by the HW's. Loss of freedom in choice of a campsite may be worth minimizing camping contacts. In a similar vein, the option of an overall seasonal use limit was supported by all, but most strongly by the HW's.

Responses to the management options were analyzed in a similar manner for the parkism groups, but few options showed significant differences. None of the campsite development questions differed significantly. However, a significant relation was found in the responses to the suggestion to limit group size—63 percent of LP's, 82 percent of MP's, and 84 percent of HP's were in favor of limiting group size. Because parks are considered highly regulated and controlled environments, it is reasonable that those who support park values would tend to be more in favor of regulation to maintain park experiences.

With respect to use limitations, the HP's were most supportive of an overall seasonal use limit, while LP's were neutral. However, although all groups opposed zoning the two rivers, HP's were more opposed than the other groups. Finally, all groups were opposed to a lottery but the MP group was less strongly opposed than the other two groups.

DISCUSSION AND CONCLUSION

The wilderness value scale appears to lend support for the Stankey methodology as applied to the specific example of wilderness. In the given circumstance, a reliable scale was derived that gave consistent results. Attitudes toward wilderness values do take part in a larger framework of attitudes toward natural environments that will shape responses to suggestions for action in such areas. People who had strong wilderness values tended to be more sensitive to crowding when exposed to the same numbers of persons as other groups. Further, such individuals reacted more strongly to seeing increased numbers of people than did other groups. The HW's also supported management measures that would make crowding less obvious and opposed options designed to increase facilities.

Although the wilderness scale worked as expected, the park scale showed little to support its value. Some significant differences were observed, but there did not appear to be any consistent pattern that could be useful to interpret for management purposes. It appears that even though it is possible to construct a scale and differentiate people according to values toward parks, these values are not necessarily associated with specific attitudes toward the appropriate uses of areas.

Institutionalized definitions of places represent only one type of input to an individual's mental schema concerning those environments. Personal experience, popular literature, and one's peers may all play a significant role. That a scale for "parkism" based on formalized meanings failed to differentiate among users in any conceptually useful way does not mean that shared images of such environments do not exist or guide behavior. Rather, types of meanings must be searched for that may be more salient for the users themselves.

One may also view the results as suggesting that Park images are widely shared but extremely general. It would be useful to understand how the general image of "National Park" interacted with the specific environment of "Green River in Dinosaur National Monument." The latter may be much more useful in understanding the influence of image upon behavior. This is likely applicable to the wilderness concept as well, because many people may not view Dinosaur as much of a wilderness even though they tend to have high wildernism values.

The Parkism scale was developed using questions that would separate users rather than picking items with universal agreement. Many areas of common perception were filtered out. However, the more widely shared an image, the more general it is likely to be in definition, suggesting limited impact upon individual behaviors. Park perceptions, therefore, could be geared more to specific situations of interaction rather than toward generalized images of a very diverse system.

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POLITICS AND RESEARCH UTILIZATION: A CASE STUDY OF RIVER RESEARCH IN GRAND CANYON

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Social scientists for a long time have wrestled with the problems of applied versus theoretical research. The arguments against scientists' involvement in policy research can be summarized as follows: applications may divert scientists from their "true" priority of broadening knowledge, scientists may be pushed into premature judgments based on inadequate knowledge, the choice of issues by sponsors may distort the development of a discipline, and scientists may accept without question the sponsor's value orientations (Weiss 1977). However, most social scientists accept some overlap between science and policy. Applications of science have a long tradition and there are opportunities for theoretical advances as well as impacts on programs.

Research application means that results aren't simply absorbed into some body of scientific knowledge. Utilization, then, becomes an important issue. But the extent to which research results are "used" varies greatly. Some reports are shelved and never seen again; others become an integral part of planning and management. How is research used and what causes these differences in utilization?

The most common assumption is that policy decision-making is done rationally and linearly. A problem is identified, but the information needed to generate or choose among solutions is lacking; research provides that information and a wise decision can be made. This view, however, is usually too simplistic. The policy world is a busy place, and policymakers are in a dynamic relationship with information sources as diverse as administrators, politicians, journalists, interest groups, and social scientists. An "interactive" view of research utilization makes more sense, emphasizing that the process is at times disorderly and reiterative in spite of attempts to introduce rationality. Research is only one kind of input, and it may even be used by policymakers for purposes other than decision-making. These include delaying action, avoiding responsibility, discrediting an opponent or policy, or gaining recognition for success or support for future programs (see Weiss 1977 for a discussion of these issues).

The factors affecting research utilization can be divided into two general categories. The first concerns "scientific" characteristics of the research itself, including methodological quality, relevance and timeliness of information, and strength of findings (Cox 1977, Rossi and Wright 1977, Hawkins *et al.* 1978). Scientists tend to focus on factors in this category, particularly methodological problems such as defining research issues, designing the study, and reporting results in terms that make sense to clients. This kind of scientific integrity is also a concern of many in resource management positions (Kilgore 1978).

High quality is clearly necessary if research is to stand up in the public policy arena. By itself, however, high quality is not sufficient to ensure that results will actually be used in decision-making. Even good research sometimes gets a cool reception, and the possible reasons for this fall into a second category of "political" factors affecting utilization. These factors will be the focus of this paper.

Research is done in a political environment. The use of the word politics, particularly among scientists, conjures up images of unsavory scheming and devious tactics. But in a more ideal sense, politics can be defined as getting things done where people are involved, and this necessarily means dealing with personalities, values, budgets, bureaucracies, regulations, laws, and conflicts between interest groups. Research becomes involved with these kinds of things as it is "put to work." Political factors that may

affect research utilization include (1) organizational constraints in agencies or bureaucracies, (2) the magnitude of organizational commitment required for good evaluation, (3) differences or conflicts between the "cultures" of scientists and practitioners, (4) the extent of coordination among agencies required for implementation, (5) the magnitude of risks and predictability of consequences, (6) the amount of social conflict over values implicit in proposals, and (7) the complexity of the issues involved (Bolan 1969, Cox 1977, Hawkins *et al.* 1978).

A recent paper by three river managers (Mak *et al.* 1977) indicates that resource management decisions are often made in the less tidy interactive manner described earlier. Several papers on planning suggest the same conclusion (Beckman 1964, Bolan 1969), as does my own experience with a number of research projects. The rest of this paper will be a discussion of research on the Colorado River in Grand Canyon. The next section will present a case study in order to explore the interactive nature of the decision-making process. The concluding section will draw on the case study to learn more about how political factors affect research utilization.

GRAND CANYON

The Grand Canyon has an interesting recent history. It began with problems of crowding and conflict in the late 1960's and early 1970's and has now progressed through the Final Environmental Statement (FES) on the River Management Plan. The Plan outlines a comprehensive management strategy based on research results, public involvement, and management effort. The following draws heavily from a more thorough historical review by Shelby and Nielsen (1976d).

Problems and Controversy

River runners and managers alike were alarmed by rapid increases in use (from 547 people in 1965 to 16,428 in 1972). The 1971 Draft Master Plan for Grand Canyon National Park indicated a concern for river management issues and suggested that river trips should provide a "wilderness experience." The River Use Plan issued in 1972 was an attempt to address the problem of uncontrolled use, but the Plan contained two bombshells. The first concerned **use levels**. Commercial outfitters had been allotted 105,000 user days for 1972 but had used only 89,000; they would be held to this for the next few seasons. In addition, however, the Use Plan called for a further reduction to 55,000 user days by the 1977 season.

The second bombshell involved the use of **motorized rafts**. The Plan acknowledged the issue was somewhat subjective but indicated that the goal was to provide opportunities for an intimate man-nature relation in which the river was run "on its own terms." Therefore, motor use on river trips would be phased out.

The plan was a laudable attempt to establish management goals, but **it went too far with too little information**. Controversy raged over the use level and phase-out issues during the next year and a half. The basis for the decisions was unclear, and they appeared final even though the Use Plan indicated the need for a "coordinated research program." In March of 1973, with the River Use Plan only 3 months old, the Department of the Interior issued a defensive statement that began "The decision which has been made regarding limitations on public use and motors on the Colorado River...was not made hastily and without taking into account all relevant factors." The document indicated that further information was needed regarding use levels and that several years would be required to collect it. The reduction of use was thus put on a conditional basis pending the outcome of research.

In regard to the motor-oar issue, however, the Interior document restated the apparently inflexible position presented in the River Use Plan: "motors are antithetical to the quality of a wilderness experience that is, and should be, obtainable in the Grand Canyon." It went on to evaluate the advantages of both oar and motor trips. The lack of air, water, and noise pollution were seen as advantages of oar trips, although "the environmental or sociological impact of such pollution" was not yet known. However, pollution was not the only issue. The Canyon was described as a "refuge from the pressure of modern life," a unique place in which one could "escape civilization." Oar travel was in keeping with the nature of the river-canyon "sanctuary."

The arguments in favor of motors fell into two categories—safety and convenience. Proponents of motor travel said that the greater size and power of their craft reduced danger in rapids, and that motor travel was easier, faster, and cheaper. The Interior document dismissed both contentions, but controversy over the motor-oar issue generally continued to form along these same lines. The point is that **the agency was using two different sets of "ground**

rules;" the use level issue would not be decided until research results were available, but the motor-oar issue had already been decided even though everyone acknowledged the need for more information.

There was one final but important point. Other regulations, such as those affecting trip departures or camp practices, were favorably received by most river runners. **No one seemed to contest the need to regulate or the agency's legitimacy to do so**; only the content of particular regulations was in question.

The river outfitters organized and filed a court suit, which they lost. They then increased their efforts at political and public pressure. The response of Park Service personnel was marked by hasty, inconsistent decision-making, and neither they nor the outfitters functioned at their best. Controversy centered on the motor phase-out issue.

An October 31, 1973, news release from Regional Director Howard Chapman said that the motor phase-out had been "deferred pending further study." At this point it appeared that both the motor-oar and use level issues would be researched. However, a December 10 letter to Senator Goldwater from acting Secretary of the Interior Whitaker indicated that studies would "in no way alter" the goal of wilderness classification for the River. This was supported by an April 2, 1974, letter from NPS Director Walker to Senator Steiger, which stated "the motors decision has already been made."

The outfitters continued to apply political pressure, maintaining their position that studies should form the basis for the motor-oar decision. This finally had an effect, and on June 3 Director Walker **reversed his earlier position**. He stated in a letter to Senator Jackson that studies would "provide a base" for river management decisions and that "existing river uses would...not be changed" until the study was completed.

Studies were conducted during the next 3 years. The sociological research centered on the carrying capacity and motor-oar issues. It is interesting to note that while the research was being designed and initiated, allocation of permit between private and commercial users had not yet become an issue because allotments allowed all the use that had occurred in 1972. However, allocation began to appear inequitable as applications for permits in the private sector exceeded the number available by a greater and greater margin. In the progress report for the first year pilot study it was pointed out that the growing private-commercial controversy had not been mentioned or funded in the original contract, and the study would not sample private trips or look at this issue. When outspoken private users learned of this and expressed their displeasure to the Park Service, the Agency decided to provide additional funds to address the problem. Allocation had now become an issue, and **pressure from an interest group prompted research**.

The sociological study report (Shelby and Nielsen 1976a, b, c, d) was submitted in June of 1976 and reports on the 28 other studies were received at about the same time. These included an economic analysis of outfitting businesses; a campsite inventory; a study of trails; ecological/biological studies of streamside flora and fauna, human waste disposal, fish, and water quality; and studies of hydrology and erosion. The Park Service summarized the findings and began integrating the results into a management plan.

A year and a half later, late in 1977, the Park Service issued a Draft River Management Plan and a Draft Environmental Statement (USDI 1977a, b). These documents included proposals for establishing a carrying capacity and limiting motor use which were finalized in a Final Environmental Statement in July 1979 (USDI 1979). The following information is drawn from all three documents.

What Was Decided?

The management plan first established the goals—"The goals for management of the Colorado River in Grand Canyon will be to perpetuate the wilderness river-running experience and to attempt to mitigate the influences of man's manipulation of the river" (USDI 1977a). The wilderness experience goal was supported by earlier documents including the 1971 Draft and 1975 Final Master Plans for the park, input from public meetings, two surveys of river users, and the judgment of managers. **The solidity of this goal was extremely important throughout the discussion and controversy** that surrounded the development of the management plan. Managers referred to it continually, explaining how proposed policies fit with the management goal. If someone questioned a policy, they had to either show why it didn't serve the goal or question the goal itself.

Use levels and carrying capacity

The management plan considered three different types of carrying capacities—ecological, physical, and social. **Ecological** studies showed that current use was causing changes that were a function of use patterns and activities rather than of overall use levels. One party using inappropriate camping techniques (e.g. for waste disposal) had a greater effect than many parties using lower impact methods. The solution was a set of prescriptions aimed more precisely at decreasing impact, including carryout of human waste, eliminating wood-gathering for fires, and establishing an education program to inform users of appropriate use practices. In the biological area, then, research showed that **an overall cutback in use was not necessary to achieve the desired ecological conditions**.

One of the alternatives considered in the decision process was to "increase visitor use level to the absolute **physical** capacity of the system." A physical carrying capacity based on a computer simulation model was worked out using data from the campsite inventory study. Assuming one party per beach and a 4- by 8-foot flat area for each person for sleeping, each site was evaluated in terms of the largest party it could accommodate. "Under a very tight scheduling system of launch days and times, campsite space assignment, structured river travel restrictions, time and area limitations at attraction sites, and a standardized trip length of 12 days, this alternative could ... (result in) ... an 85 percent increase in total visitors and a 242 percent increase in total user days" (USDI 1979).

The greatest impact of this alternative would be social. Standardizing trips would "significantly reduce options for trip variety and experiences." Strict scheduling would be required to reduce encounters among groups, and even then they would exceed current levels. Regimentation would also occur in other aspects of the trip. In sum, "regimentation, scheduling, and lack of options would detract from the quality of the visitor's experience" (USDI 1979). Research in this area showed that **the canyon was physically capable of holding more people, but no one seemed particularly interested in the necessary trade-offs**; the result wouldn't fit anybody's idea of a wilderness experience.

What about **social** capacity? The management plan described a wilderness experience in terms of close contact with the river-canyon environment without interference from other parties. Research had shown that use was concentrated in both space (popular attractions and camps) and time (heavy use days of the week and months of the year). The problem was to establish a number that would allow as many people as possible to use the resource without exceeding policy standards describing the desired experience.

The solution required a lowering of use at peak times. Although this might have been accomplished by decreasing seasonal use levels, a more efficient approach (Shelby and Nielsen 1976b) was to establish the daily launch limits that data showed would produce a contact level in line with most people's preferences (three or less encounters with other groups per day). It was then possible to lengthen the season so that this number of parties could leave on as many days as possible. Clear management objectives (reducing encounters) and research showing the connection of management alternatives (use levels) to visitor experience preferences (encounters) made it possible to plan for **a higher quality experience with a substantial increase in overall use**.

The plan also called for a 6-month summer season and a lower use winter season. Although the primary justification for the lower winter level was biological, it was also intended to "provide for a wilderness river trip where the likelihood of encountering other trips is remote" (USDI 1979). **Interactions between researchers and managers had helped both groups think more clearly about experiences, and the plan provided for two kinds of experiences with different encounter levels**, a first in river management.

Motors and oars

The "wilderness experience" goal was a major consideration in deciding the motor-oar issue. The plan defined the experience in terms of opportunities for relaxed conversation, interpretation, off-river hiking, a close relation with the natural environment, and meeting the river on its own terms. The problem was to determine the kind of trip that best met these management objectives.

Research results showed a number of structural differences between standard motor and oar trips (Shelby and Nielsen 1976d). Motor trips had more people, fewer boats and boatmen, more people per boat, and more contact with other parties than oar trips. People on motor trips also spent less time in the canyon and made fewer and shorter side trips than those on oar trips. But how did these differences affect passenger perceptions and experiences?

Experimental combination trips allowed passengers to travel half of the canyon on an oar-powered raft and the other half on a motor rig. After experiencing both kinds of trips, an overwhelming majority (80 to 90 percent) preferred oar travel (Shelby and Nielsen 1976d). Reasons given by passengers included the slower, more relaxed pace, the opportunity to experience natural sounds and water movement, and the smaller, more comfortable social groupings. People described motorized travel as speedy, hurried, rushed, noisy, loud, and crowded. By contrast, oar travel was described as leisurely, relaxing, peaceful, quiet, friendly, individualized, and intimate. The data, then, were fairly compelling; motor trips just didn't seem to fit with the Park Service's definition of a wilderness experience.

The Management Plan called for a phase-out of motorized travel. The data suggested that the conversion to rowing trips would lead to smaller parties, smaller boats, fewer people per boat, a lower passenger-guide ratio, longer trips with more stops at attraction sites, and quieter travel. The fast, short trip would be eliminated. **These differences would change the character of river trips to be "more consistent with a natural or wilderness experience,"** with greater opportunities for a close relation with the environment, relaxed social interaction, and interpretation by guides (USDI 1979). Data from other studies were used to show that the decision would have little impact on biological, economic, or safety factors and would reduce noise and water pollution.

The decision was fairly unique in river management. Biological and economic factors had been considered but did not show major differences in the impacts of motor versus oar trips, so the choice had been made primarily on the basis of social aspects of the visitor experience. But most importantly **the Agency had specified management goals and made a commitment to a "public" decision process; data were then gathered that helped clarify goals and showed how different alternatives fit with them.**

Interactive or Linear Decision Making?

To summarize, the case history for Grand Canyon shows a somewhat disorderly interactive decision process. The Park Service reacted to initial problems of crowding and conflict with decisions to greatly reduce use and phase out motors. Those decisions would have been controversial anyway, but their apparent arbitrariness in the absence of supporting data left them open to question. Strong political pressure from a variety of sources caused the Agency to back down until more complete information was available. Data were collected and as a result the use level decision was reversed and use limits were raised. The decision to phase out motors remained the same, but it was based on more specific management goals and solid information about which alternative best accomplished those goals.

POLITICAL FACTORS IN RESEARCH UTILIZATION

Political factors appear to play a major part in the way research is used. In this section, I would like to draw on the Grand Canyon case study to develop specific statements regarding the ways politics enter into the utilization process.

(1) **Determining policy direction is an interactive process, so management goals should be stated as early as possible; they can be more thoroughly developed as information becomes available.** In Grand Canyon the "wilderness experience" goal was suggested in 1971. Succeeding documents restated and clarified the goal as public reaction and research results provided more information. By the time final documents were written, the goal was clearly defined and well established. General goals are needed at the outset to determine the relevant areas for research and give the public information about what managers are thinking. And as data becomes available, managers will be more aware of possibilities and public sentiment. Grand Canyon data helped clarify objectives for carrying capacity as well as for travel modes.

Stating management goals will also help focus the interactive process. Critics can disagree with goals, giving managers a chance to reconsider and possibly modify their position. Critics may also agree with general goals but disagree with the action chosen to reach them. This may encourage managers to think of more effective policies or users to suggest alternatives of their own. Both cases are likely to create situations in which managers and users work together to come up with the best solution.

(2) **A single or lead agency will probably be more effective in developing policies than multiple agencies that require greater coordination.** The Park Service had primary responsibility in Grand Canyon; it had to contend with public controversy, but at least there wasn't another agency with a different mandate, conflicting traditions, and another set of managers. Even when the content of decisions was controversial, no one questioned the legitimacy of the agency to decide. The Rogue River in Oregon provides a contrasting example. The USDA Forest Service and Bureau of Land Management control the adjacent land, the State Marine Board has responsibility for rules governing use, two counties feel they should be involved, and people in the local area think of the Rogue as "their" river. Attempts to establish a lead agency have been only partially successful, so management decision-making requires an incredible amount of negotiation.

(3) **Decisions based on poor information won't hold up.** The early decisions to reduce use and eliminate motors in Grand Canyon are classic examples of managers going beyond their data and soon being forced to back down.

(4) **Agencies can establish the "ground rules" regarding the use of scientific data.** The Park Service did this unwittingly in the early stages at Grand Canyon by saying that carrying capacity decisions would take research results into account while the decision to phase out motors would not. Opponents of the motor phase-out argued that the same principle should be applied to the motor-oar issue. Outfitters as an interest group fell into the ironic position of bludgeoning a reluctant Park Service into a more extensive research effort. The same thing happened later when allocation became an issue and private users insisted that sociological research should be extended to include private trips.

(5) **Controversy may be liberating as well as nerve-wracking.** With highly political issues, **any** decision is likely to be questioned—probably in court. In Grand Canyon the outfitters threatened litigation if motors were banned, and the Sierra Club threatened the same if they weren't. Managers knew they would be questioned either way, and they appeared to set the controversy aside while they used their extensive base of research and public involvement to make the most defensible decision.

(6) **A good information base requires an investment of time and money.** The Colorado River Research Program for Grand Canyon took 3 years of intensive work on 29 different studies at a cost of about $750,000. Areas that lack the national prominence of a place like Grand Canyon obviously cannot afford and may not need this kind of investment, but this often is used as an excuse for limited data, poor quality information, and "shoot from the hip" decisions. If policies are questioned, the investment in good information may save a great deal of time and money that would otherwise be spent defending and backtracking. An on-going monitoring program may also be necessary.

(7) **Research may serve purposes other than information-gathering.** The research program in Grand Canyon "bought" 3 years of time to stabilize use under an interim management plan. This gave everyone a chance to define the issues and think about and experiment with solutions in a more relaxed atmosphere in which new ideas were less threatening. The issues were complex and all parties had a chance to become "educated."

(8) **Research may suggest less controversial solutions in which "everyone wins."** The carrying capacity issue in Grand Canyon is a good example. Lowered daily launch limits made encounters less likely, but lengthening the season meant overall use was increased and no user group faced a major cut-back.

(9) **A controversial issue may create some "breathing room" for making decisions about another less controversial one.** Arguments about motor travel in Grand Canyon have in many ways overshadowed the carrying capacity decision, resulting in less discussion about what might otherwise have been a hotly contested issue. It would be hard to design this kind of situation but perhaps easy to take advantage once it was recognized.

(10) **Social science research results supported the views of less vocal groups, so research results may be attacked by more vocal groups.** Grand Canyon data from public meetings and user surveys showed that most people supported the "wilderness experience" goal, but these findings were questioned by some outfitters whose views had previously carried greater weight. Similarly, outfitters running motorized trips were quick to contest results from the motor-oar experiment that showed user preferences for oar travel.

(11) **Dialogue between managers and researchers is essential.** Meetings with Park Service personnel and an annual Grand Canyon Research Symposium provided a number of opportunities for

researchers to report preliminary findings. This encouraged them to organize their thoughts and allowed managers and others to see patterns emerge. All groups had numerous opportunities to identify unanticipated problems and take corrective action, and managers were able to learn about issues along with researchers. The final research reports contained more details but no major surprises. Work with allocation systems in Hells Canyon presents a contrast. After the project was begun, we worked for more than a year with only a few meetings with Forest Service personnel. When we submitted a draft of our final report, the Forest Services's reaction was surprise mixed with chagrin. They were counting on specific recommendations that we had consciously avoided. In several subsequent meetings we negotiated the issue and agreed to add a section to the final report. The problem was solved, but it should never have arisen in the first place.

CONCLUSION

Researchers and policy-makers work in different worlds. They have different roles that are separated by the demands of day-to-day tasks and the time and distance that make it hard to get together. Engaging in purely theoretical research maintains the separation. But research application creates an area of overlap in which each group has to learn something about the other; cooperation is needed to get high quality information and use it effectively. From a scientist's point of view, this means recognizing the interactive nature of the policy world and understanding the ways that politics affect research utilization.

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BACKCOUNTRY MANAGERS NEED SOCIAL SCIENCE INFORMATION

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Backcountry or wilderness portions of the National Park System provide unique opportunities for solitude encounters with nature. Backcountry managers must be sensitive to this wilderness character as they manage these areas to "preserve and allow for enjoyment." As use of these areas increases and impacts on the resources and experience increases, the manager often will need to set a limit or carrying capacity. To give direction to carrying capacity deliberations, management objectives must be established. Carrying capacity for backcountry has three basic limits —physical, biological, and social. Of the three, the social limits are the most difficult to set and are usually the most restrictive. The social capacity looks into the nature of the experience itself and considers such things as number and types of encounters, group sizes, kinds of activities, modes of travel, visitor perceptions as to quality of experience, etc. This kind of information was valuable in setting a capacity for river running use at Grand Canyon. This information was provided by social scientists and is best used to set and evaluate social capacity limits for achieving specific management objectives. Decisions are not directly derived from research; many other factors must be considered. These are not the traditional tools of park managers but are essential to respond to the current and rapid growth in backcountry use. Failure to set capacities is a management action that will profoundly affect visitor experience. Information from the social scientists is critical to setting social capacities for backcountry or wilderness areas of the National Park System so that those areas will provide the opportunity for high quality visitor experience.

WILDERNESS IN NATIONAL PARKS

Within the National Park System, many areas of natural backcountry remain in an undisturbed condition. Some of these areas are extensive, contain unique features, and provide outstanding recreational opportunities. Although few Park System units are designated wilderness, many of them fit the definition of wilderness. Some areas have been proposed for addition to the wilderness system and most are being managed as though they were wilderness. For the purpose of this paper, backcountry will be considered as synonomous with wilderness.

The purpose of the National Park Service is to manage all areas within the System—"to conserve the scenery and the natural and historical objects and the wildlife...and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." This is an oft repeated phrase within the National Park Service, but, is the very heart of its existence. The phrase translates into a variety of management actions for the wide variety of park areas. For the backcountry manager of park areas this phrase may be more critical than to most other park managers. The backcountry manager has a portion of the natural setting within a national park or monument that by its very nature must remain the least impaired of any and perhaps provide the most in-depth, profound, and extensive of all park experiences.

Recreational use of backcountry areas within the Park System has skyrocketed in the past decade. A classic example of increase in backcountry use is that of whitewater river running. On the Colorado River within Grand Canyon, river running use increased from 2,099 people in 1967 to 16,432 in 1972. On the Colorado River, in Cataract Canyon within Canyonlands National Park, use increased from 585 people in 1969 to 4,422 in 1973. In Dinosaur National Monument on the Green and Yampa Rivers, the number of river runners increased from 2,493 in 1967 to 16,739 in 1973. In all of the above situations managers observed very rapid deterioration of riparian ecosystems of these rivers. Trash and litter became significant problems. Human waste disposal

became a critical problem and multiple trailing at attraction areas along the rivers became a serious impact. In addition to these very obvious and recognizable impacts, managers began to receive reports from river runners voicing dissatisfaction with the river running experience, particularly noting crowding at attraction sites and popular camp areas. This dramatic increase in use and the related problems that surfaced are not unique to river running. In almost all park areas that have backcountry hiking opportunities the same scenario was repeated during the same approximate time. Concern over these mounting problems has been expressed by many managers, backcountry users, conservationists, etc. This situation was also common in backcountry areas managed by Forest Service, and Bureau of Land Management during recent years.

CARRYING CAPACITY

As managers began to react to these problems they found that some research work had been done in regard to capacities for backcountry or wilderness areas. One of the solutions recognized by managers and suggested by researchers was to establish a carrying capacity for the backcountry or wilderness area in question. In establishing a capacity for a given area the manager must recognize many variables that will affect his particular situation. The overriding and most important of all considerations that the manager must keep in mind is the **management objective** for the area. This objective will likely have been established and articulated in a general management plan for the park. If not, this objective is the first task of the manager and will include consideration of the legislation establishing the park area, data on park ecosystems and current use, as well as public input. Once objectives have been established, the manager can proceed to develop data that will aid in making a decision on carrying capacity. Capacity is generally a function of the physical, biological, and in recent years, social limits of a given backcountry system. Experience during the past few years indicates that the physical capacity can be readily assessed by conducting an inventory of the access system (roads, trails, and rivers) and available campsites within a backcountry. The biological capacity can be developed by assessing the kind and magnitude of impacts that will be imposed upon a system if used at full physical capacity.

The social carrying capacity of a backcountry area is much more elusive than either the physical or biological capacities. The social capacity relates largely to the quality of experience available for the visitor to a backcountry area. This is a function of (1) number of people, (2) group size, (3) length of stay, (4) method of travel (hiking, boating by motor or paddle or rowing boats), (5) number and kind of encounters among groups or individuals, (6) type of activities (boating, hiking, climbing, camping, fishing, etc.).

EXPERIENCE AT GRAND CANYON

Experience at Grand Canyon during the past few years with both river running and backcountry hiking indicates that the biological capacity of a system will normally be more restrictive than the physical capacity. And the social capacity will be more restrictive than either the physical or biological limits.

In working toward a physical capacity for the Colorado River, the most limiting physical factor was campsite availability. Studies indicated that only 25 to 30 percent of the beaches were being used. Research data indicated that the physical capacity could be tripled, but rigid scheduling of trips would be necessary, compromising the quality of experience.

In establishing a biological capacity, no direct correlation between number of people and environmental damage could be established. In fact, setting specific **requirements** on the existing number of river runners was sufficient to protect the riparian and side canyon areas of the canyon from unacceptable impact and thereby be within the biological carrying capacity of the system. Therefore, it can be said that **patterns of visitor use are more important biologically than are number of people** (Carothers and Aitchison 1976). The variety of requirements used to control visitor use patterns that have proven successful include hauling out human waste, hauling out all trash and litter, using fire pans, hauling out all ash and charcoal from fires, building fires only during certain times of year to conserve firewood supplies, constructing single trails at attraction sites, and straining all liquid kitchen wastes.

Physical and biological capacities of the river riparian ecosystem on the Colorado River within Grand Canyon were easy to establish compared to the sociological capacity, which more directly affects the quality of experience. The mode of travel (motor or oar powered); ratio of commercial passengers and noncommercial river runners; and congestion,

crowding, and contact factors were much more difficult to determine. Data gathered by sociologists provided information for river managers at Grand Canyon that were useful in establishing the sociological capacity (Shelby and Nielsen 1976a, b, c, d). Findings that proved to be most useful for forming a basis for these decisions included:

- Existing levels of encounters between groups, as well as visitor preferences on levels and type of encounters.
- Relation between visitor satisfaction and levels of encounters, wilderness character of the trip, and contacts and crowding.
- Visitor perceptions and preferences regarding motorboat and oar boat travel.
- Demographic characteristics of motorboat and oarboat visitors and commercial and noncommercial river runners.

In considering the social capacity of a backcountry area it is necessary to refer to management goals for that area and determine the amount and timing of use that would produce the desired level of encounters.

Research can provide information to the manager as to how well an existing or proposed management system will achieve established objectives but it cannot be used to establish objectives. Research data on physical, biological, and social limits on river running at Grand Canyon were valuable in developing a carrying capacity for the river system. However, continued research monitoring will be essential to evaluate the management plan and either validate the decisions made or indicate needed changes. A major failing of managers is to research a particularly difficult problem on a one-time basis with no follow up monitoring of the decisions made. In fact, research is **most** useful to backcountry managers when it is used to evaluate the success of a management system. It is important to emphasize that decisions are not converted directly from research data to management policy. The manager must play the sociological research data against the objectives for management of the area as well as physical and biological data and public input. Referring again to the river management situation at Grand Canyon, data on current use levels related to contacts and crowding were useful in setting use capacities. However, to make a decision it was necessary to consider the variation in skill levels between commercial and noncommercial river runners to follow resource protection procedures, shift in type of boats from motor to oar, change in trip length, economic viability of concessionaires, and public and political input.

TRADITIONAL MANAGEMENT TOOLS

The traditional management method used by the National Park Service was to set limits on the basis of the location of roads and trails, number and size of campgrounds or recreational vehicle parks, and amount of motel or hotel accommodations available. The aggregate of such facilities establishes an overall capacity for a given segment of a park. An example in which this method was used is for the South Rim Village of the Grand Canyon. There is a specific number and distance of roads and trails, that will daily accommodate a certain number of vehicles and people. There are a certain number of hotel or motel rooms, and a specific number of campground, picnic, and recreational vehicle sites. Therefore, only so many people can reasonably gain access to the South Rim Village each day. The density of visitors directly affect the quality of experience that is to be provided for the park visitor. The management objectives for the South Rim Village are to provide a high density, developed type of experience. Therefore, these management methods are appropriate. For backcountry areas, these management methods are not appropriate and managers must find other ways to meet the objectives.

INACTION IS A FORM OF MANAGEMENT

The type of experience to be provided for the visitor is controlled as much by what we do not do in terms of management as by what we do. If we do not set limits for the concessionaire or the do-it-yourselfer, they will set their own and the quality of experience will be affected accordingly.

KINDS OF INFORMATION NEEDED

In a backcountry or wilderness situation the level of contacts or crowding must be more closely scrutinized because the visitor to this type of area is usually much more sensitive to contacts than a developed area visitor. Therefore, the manager must consider how many people or groups can be allowed in a given part of the backcountry on a given day, week, month, or season. This is necessary so that contacts between

people and or groups are kept at a level that maintains the quality of backcountry experience at an acceptable level. What that acceptable level may be will vary from area to area. Therefore, the manager must have data on what the general visitor's perceptions of appropriate crowding and contact levels are for a given area. The manager also needs information on existing levels of use, crowding, and congestion as well as on demographic characteristics of the visitors. With this kind of basic data the manager can begin to make reasonable decisions on use and management of backcountry areas of the National Park System.

SITE SPECIFIC DATA NEEDED FROM SOCIAL SCIENCES

Much sociological data on backcountry use and users can be applied generally from one area to another. However, it is essential that a manager closely scrutinize such data before applying it to another area. In most instances, it will be best to also develop site-specific information. Most importantly, it is imperative that a manager set up a monitoring program on social interactions of backcountry users to test the continued validity of any decisions that are made from data provided from initial research on the specific situation or borrowed from another area. This kind of information can best be provided from the social sciences.

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PUTTING RIVER RESEARCH TO WORK: A CARRYING CAPACITY STRATEGY

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A major problem in determining recreation carrying capacity for large wildland areas has been a lack of research data (Burch 1974). An effort was made to rectify this deficiency at Ozark National Scenic Riverways (ONSR) in southern Missouri by designing a research program in 1972 (Chilman *et al.* 1977). This multifaceted program was implemented from 1972 to 1977. The question then became how to put the research results to use in a management decision process that included public involvement.

The first step was to make the research results accessible and open to evaluation. This was accomplished by publishing a report that summarized the rationale, methods, and results of the various recreation carrying capacity research projects (Marnell *et al.* 1978). These projects included studies of canoeist numbers, site impacts, water quality, safety factors, and visitor characteristics and perceptions. More than 500 copies of this summary report were distributed prior to public hearings in September 1979 so that the public would have an understanding of the information base developed by the National Park Service for this decision situation.

The next step was to derive a descriptive model of management decisionmaking steps related to recreation carrying capacity concepts. This model was needed because of confusion about how the ONSR river research data related to various aspects of recreation carrying capacity decisionmaking. The model was derived from a review of the recreation carrying capacity literature, as related to the experience with carrying capacity decisionmaking at ONSR and in other field locations (U. S. Department of the Interior 1977).

THE DECISION SITUATION

Ozark National Scenic Riverways is a large and complex river recreation area. It encompasses 140 miles of land corridor along the Current and Jacks Fork Rivers in southeastern Missouri. The attractions of Ozark Mountain scenery and clear, free-flowing rivers coupled with relative safety of floating have made ONSR a popular recreation attraction.

The canoe floating use of ONSR has increased an average of 10 to 15 percent annually since it was established as a National Park Service management unit in 1964. The number of floater days has increased from an estimated 40,000 in 1968 to more than 242,000 in 1977 (Marnell *et al.* 1978). A straight-line projection of 10 percent annual increases would more than double the 1977 number to 515,000 by 1985. Questions began to be raised about how much canoe use could be sustained without seriously impairing either the ONSR environments or the recreation experiences of visitors (Jackson 1970).

The approach to dealing with the increased river use centered around a river use research program recommended in 1972 (Chilman *et al.* 1977). The approach (1) utilized an integrated research program, (2) recognized the need for several years to implement the program, (3) recognized that several research disciplines would be involved, and (4) utilized recreation carrying capacity as an integrating concept for considering the diverse factors involved.

Because ONSR is administered by the National Park Service as a National Recreation Area, a parity between human and environmental considerations was needed in setting research priorities. In terms of budget and manpower expenditures, these two broad considerations received approximately equal attention (Marnell *et al.* 1978). All problems attending river floating use of ONSR could not be addressed at once. Therefore, priorities were set on the basis of two criteria: (1) investigative efforts had to produce meaningful data within imposed time and fiscal constraints, and (2) some prospect, both practical and political, had to exist for relieving some of the pressures on the National Park Service management. The program was also designed with the assumption that additional research would follow to compensate for short-term deficiencies (for example, more long-term studies are needed on the status of various rare or endangered wildlife species).

An important factor associated with the recreation carrying capacity decision strategy at ONSR was the time frame involved. Recognizing the need for several years to implement the research program allowed for in-depth thought about recreation carrying capacity concepts and rationale as well as for collecting research data. In many previous situations in which field managers looked to recreation carrying capacity for relief from problem situations, immediate or short-term solutions were demanded. In these situations, no time was allowed to study the complex environmental and social factors involved in carrying capacity determinations.

The research program time frame at ONSR was instituted in the form of a 5-year management moratorium on increases in numbers of canoes allowed to be rented by concessionaires. This attempt to preserve the status quo did not succeed in holding river use at 1972 levels (canoe use increased on other than peak weekend days and from canoes brought in by other than licensed concessionaires). However, it did provide time for more structured carrying capacity decisionmaking.

In retrospect, no more of a crisis exists at ONSR currently than existed in 1972. This suggests that thinking about a solution to management problems of a complex carrying capacity nature might usefully be replaced by a concept of a "program of actions." We should think about carrying capacity as more than a calculation and also be able to visualize what actions are necessary before and after the calculation step to make decisions about recreation carrying capacity.

THE ONSR RECREATION CARRYING CAPACITY PROCESS

After the research program was completed, the next step was to develop a conceptual framework to indicate how the recreation carrying capacity research results related to the process of recreation carrying capacity decisionmaking. The following conceptual framework is patterned after the notion of a "planning process" as a technique used by planners to indicate or display "an organized sequence of steps requiring conscious and continuous action" (Uleck 1971). This planning process frequently takes the form of a chart displaying a sequence of steps to indicate where activity is occurring and how it is related to other considerations.

Because recreation carrying capacity was chosen as a conscious strategy at ONSR, the following sequence of steps was developed from a review of the recreation carrying capacity literature in relation to actions undertaken at ONSR since 1972. The nine-step process is outlined and each step is then briefly discussed.

These steps should not be considered as mutually exclusive, but as more or less sequential and focused on keeping in mind preceding and succeeding steps. For example, the ONSR Recreation Carrying Capacity Decisionmaking (RCCD) process is now focused on Step 5 (Public Review) but with Steps 3, 4, 6, and 7 also currently a part of decision considerations.

Step 1. RCCD Initiated by an "Unacceptable Change" in the ONSR Situation.

A major responsibility of a recreation area manager is to recognize and deal with changes in the recreation management situation (Gould 1968). This is recognized in the Lime and Stankey (1971) definition of recreation carrying capacity: "the amount and type of use an area can sustain over a specified time period without causing unacceptable change to the

physical environment or to the experience of the user." It is important to keep in mind that changes are constantly occurring in physical, biological, social, or organizational factors related to large wildland areas. The key word is "unacceptable." Often that condition is arrived at incrementally (as with increasing use) or is subtle and difficult to detect (water quality changes or visitor perceptions of crowding).

The need is to identify as clearly as possible the nature and rate of change that is triggering carrying capacity decisionmaking. At ONSR, the increasing number of canoeists was highly visible to managers and repeat visitors, and the rate of increase was indicated by annual use estimates. Specific media articles began to call public attention to these increases (Jackson 1970).

Step 2. Specific Areas Affected by Change Need Identification and Study.

The area or areas affected by the "unacceptable" changes must be identified in relation to management unit boundaries and area features. Large wildland areas, such as the 140-mile ONSR land corridor, may need to be divided into subunits, or zones, for recreation carrying capacity studies.

Maps of ONSR were used to study the increasing canoe use phenomenon in relation to access roads, traffic flows, attraction points, etc. Available information on ecological characteristics, visitor use, and management authorities and guidelines were examined.

Step 3. Research Measurements of Change Factors and Trends Instituted.

Information is often lacking in aspects relating to specific changes occurring at specific places. How many visitors are using a specific area? What is the nature of the recreation experiences they are seeking? What are the unique attractions of the area for visitors? What conflicts are occurring, and where? What specific site impacts are occurring; and at what rate? Are special features, i.e., archaelogical sites, subject to damage?

These and many other questions require specific data for decisionmaking, especially when such decisions may be subject to legal challenges. New research approaches, i.e., use of time-lapse photography for canoe counts, had to be devised to meet research needs at ONSR (Marnell *et al.* 1978). The notions of (1) designing a field unit research program to gather and integrate various data needed, and (2) developing research capacities in a field unit to direct and interpret research for management decisionmaking were part of the research considerations at ONSR (Chilman *et al.* 1977).

Step 4. ONSR Recreation Opportunities Compared to Others in Surrounding Region.

The concept of providing a spectrum of recreation opportunities for diverse types of visitors is basic to recreation carrying capacity thinking (Wagar 1966, Nash 1968, Lime 1976). Wagar (1974) emphasizes: "Examining one area at a time may be the trap that has caused so much confusion about use limits for specific areas. The crucial question becomes: what management pattern, including kinds and amounts of use, will permit this recreation area to make its maximum contribution to the sustained benefit provided by the whole system of recreation areas?"

Our experience at ONSR was that specific knowledge of the area gained in Steps 2 and 3 enabled more systematic comparisons with other recreation opportunities in the region. In particular, data were collected in 1979 on visitors' perceptions of ONSR in comparison to the Eleven Point and Buffalo Rivers and other federally administered riverways in the Ozark Mountains region. The focus is on determining unique, or differentiating, factors in river recreation to be maintained as a wider range of choice in a spectrum of recreation opportunities.

Step 5. Public Inputs and Review Toward Capacity Decision Values Consensus.

Wagar (1974) has noted: "even if research can show how areas and experiences will change with various levels of use and various management practices, someone must still decide what changes are acceptable." One of the most significant changes in resource management decisionmaking in recent years is that public review be part of the process. This does not take decisionmaking from managers, but it does ensure more systematic information-gathering and presentation.

Public agencies appear to be adapting to utilizing a variety of techniques to gain public involvement. At ONSR, the most visible manifestation of public involvement has been the scheduling of two sets of public hearings conducted at five different locations in Missouri and Illinois. The first round of hearings was conducted in September 1979 to solicit comments on management problems as perceived by visitors and others interested in ONSR. A second round of hearings was conducted in February 1980 to seek comments on alternative proposals for dealing with

identified problems. The hearings are conducted jointly by National Park Service planners from the Denver Service Center and by the ONSR Superintendent and his staff.

Step 6. Carrying Capacity Calculated.

After the area and region have been studied and the public has been involved, the carrying capacity can be calculated. Various writers have noted the central relation of area management objectives and appropriate recreation carrying capacities (Wagar 1964, Lime and Stankey 1971). Brown *et al.* (1976) indicate that the definition (or redefinition) of management objectives for an area and the calculation of a recreation use level consistent with those objectives take place at the same step in the process.

A recent example of a recreation carrying capacity calculation for a wildland river area is the draft of the Colorado River management plan (U.S. Department of the Interior 1977).

Step 7. Management Techniques Selected to Implement the Objective.

Calculating a desired carrying capacity is only part of recreation management decisionmaking. Implementation of desired capacity conditions depends on knowledge of a wide variety of management techniques (Lime 1976).

In most recreation management situations a variety of techniques will be applied to deal with various facets of desired conditions. For example, at ONSR a major concern has focused on the need to utilize a canoe use permit system to maintain "quality." Other techniques, i.e., trail development and reinforcement at Pulltite Spring, will also be used.

Step 8. Problems of Technique Implementation Must be Studied and Discussed.

Managers need to keep in mind that problems constantly arise during implementation of management techniques. Simply selecting a technique is only part of the job. Questions immediately arise about costs, additional personnel, training, etc. But, more basic are questions of legality. The Lake County Circuit Court ruled that the Michigan Department of Natural Resources did not have authority to enforce regulations devised to deal with increasing canoe use in Michigan (Doehne 1977).

When management techniques are initiated, some users may seek ways to "beat the system," especially for various types of permit systems. Managers need to be constantly alert and exchanging information with other managers on effective implementation of management techniques.

Additionally, effects of various techniques applied on a particular area need to be considered in light of their effects on uses of other areas. Exclusion of particular uses or activities may mean they will shift to other areas where they may be even less desirable. For example, shifting some of the high density canoe use on the upper Current River at ONSR to the lower Current River may adversely affect Ozark johnboat fishermen (Marnell *et al.* 1978).

Incorporating these considerations into recreation carrying capacity thinking is indicated in Wagar's (1974) systems perspective—"How can the management of this area be coordinated with that of other areas?"

Step 9. Initiate a Monitoring Program to Measure Future Area Changes

With this step, we come full cycle to the manager's continuing responsibility to recognize and deal with changes. Along with studies to understand baseline characteristics of a recreation use situation, trend data on rates of change are important.

From studies to determine baseline characteristics, some of the aspects of ecological and visitor use conditions are selected for repeated measurements. Those measurements are programmed into a system of monitoring measurements to be repeated at selected intervals. Continuing efforts must be made to develop new types of measurements for monitoring purposes and to refine the measurements for improved effectiveness and for reducing data collection costs. For example, canoeists' perceptions of crowded conditions on ONSR were measured in 1972 and remeasured in 1977 and 1979 as a form of monitoring changes in perceived recreation quality (Chilman 1979). The two remeasurements were done in conjunction with other ONSR visitor studies as a means to keep costs down.

Beyond acquiring baseline and monitoring data, methods to organize and analyze these data and to interpret their meaning to decision participants may necessitate new types of organizational capabilities and training of personnel. This may be one of the most far-reaching implications of attempting to utilize research in recreation carrying capacity decisionmaking.

CONCLUDING REMARKS

Recreation carrying capacity was chosen as an integrating concept for researching the phenomena of increasing canoe use at Ozark National Scenic Riverways in southern Missouri. In addition to utilizing recreation carrying capacity concepts for research design, two innovations were developed to increase the effectiveness of the research. First, a river research summary report was widely distributed to improve decision participants' access to knowledge of the alternatives being considered. Second, a sequence of steps in recreation carrying capacity decisionmaking was identified and elaborated. Decision participants could then maintain an overview of various decision steps involved as they focused on utilization of research information at any particular step.

The opportunity has been unique at ONSR to work through this research-oriented sequence in conjunction with experienced researchers and concerned management staff. Our understanding of recreation carrying capacity decisionmaking has been developed in a situation with classic pressures of rapidly increasing recreation use and strong possibilities of lawsuits if use limits are established. Intensive interaction between researchers, managers, and planners was very important in our formulation of the nine-step process.

We believe that the strategy of identifying and arranging major components of recreation carrying capacity decisionmaking in "planning process" form helps to visualize and relate why we are doing what we are doing as well as what we are doing in utilizing research results at ONSR. The outlined process facilitates discussion and interaction among a variety of recreation carrying capacity decision participants in the ONSR situation.

We propose this recreation carrying capacity process model as a better way to examine important elements in recreation management decisionmaking. We now seek your comments and questions about the usefulness of this proposed model.

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KEY WORDS: trend analysis, quality recreation experiences, research application.

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